GENERAL LIBRARY,
UNIV. OF MICH.
MAR 17 1904

THE IRON TRADE REVIEW

A Weekly Journal Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

VOLUME XXXVII CLEVELAND, OHIO, MARCH 17, 1904. NUMBER 11

Pig Iron

If you are not buying from us, please send in an order and notice the advantages obtainable from doing business with the leading Pig Iron house in the world.

We can supply promptly brands containing

Silicon	**from**	**.50**	**to**	**50.00%**
Phosphorus	"	**.09**	"	**10.00%**
Manganese	"	**.10**	"	**80.00%**

Specify what you want in quality, grade, analysis and fracture.

We can select for you from fifty different brands handled by us.

Foundry and Furnace Coke

Our Coke trade has increased enormously, and is still growing.

We represent the best products of the following districts and are prepared for orders from a single carload up to the requirements of blast furnaces.

CONNELLSVILLE **POCAHONTAS**
VIRGINIA **KANAWHA**
NEW RIVER **ALABAMA**
TENNESSEE

PLEASE WRITE FOR PRICES

Rogers, Brown & Company

Boston **New York** **Chicago**
Pittsburg
Buffalo **Cleveland** **St. Louis**
Birmingham **Cincinnati** **Philadelphia**

Hydraulic Pumps

We make a type of Hydraulic Pump for small as well as large work. We have recently installed several jobs, 3,500 to 5,000 lbs., guaranteed not to injure without intervening pump governor, when load slips off. All types of pumps made by us guaranteed NOT TO SHORT-STROKE or injure load to no load.

Union Steam Pump Co., Battle Creek, Mich., U. S. A.

SHOVELS AND SCOOPS
FOR COAL MINERS, IRON WORKERS, Etc.

Write for Prices

THE AVERY STAMPING CO. Cleveland, Ohio

THE ROBERT W. HUNT & CO.
Bureau of Inspection, Tests and Consultation
PITTSBURG: Monongahela Bank Bldg. CHICAGO: 1121 The Rookery. NEW YORK: 66 Broadway.
LONDON: 31 Norfolk House.
Reports on Iron and Steel Processes and Plants. Inspection of steel rails, spikes bars, railroad cars, wheels, axles, etc. Chemical Laboratory—Analysis of ores, iron, steel, oils, water, etc. Physical Laboratory—Test of metals, drop and pulling test of couplers, draw bars, etc. Efficiency tests of boilers, engines and locomotives.

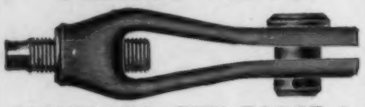
Steel and Malleable Castings.

True to pattern. Quality unsurpassed. Steel will harden like tool steel.

Acme Steel & Malleable Iron Works,
BUFFALO, N. Y.

TURNBUCKLES

CLEVIS NUTS



CLEVELAND CITY FORGE & IRON CO.
CLEVELAND, OHIO.

Fire Brick, Fire Clay, Pig Iron. *F. B. STEVENS, Detroit, Mich.*

O. TEXTOR, CHEMIST, ASSAYER AND METALLURGIST,
158 Superior Street, CLEVELAND, O.
Analysis made of ores, minerals, metals, fuel, water and foundry supplies. Ores sampled at mine, dock and furnace. Examinations made of mineral lands.

MEADVILLE MALLEABLE IRON CO.,
MEADVILLE, PA.
MALLEABLE CASTINGS of any description.
SATISFACTION GUARANTEED.

F. A. EMMERTON,
Chemist, Assayer and Metallurgist.
Ores sampled at lake ports, mines and furnaces. Mines and Metallurgical Processes Examined. Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.
9 Bratenahl Building, CLEVELAND, O.

AIR COMPRESSORS CATALOGUE GRATIS
AMERICAN AIR COMPRESSOR WORKS
NO. 26 CORTLANDT ST., NEW YORK

KEEP ASKING

The only way to get business is to advertise, and the only way to keep it is to advertise all the time. The blacksmith doesn't strike once, then wait until the iron cools to feel the dent—he keeps striking while the iron is hot. Keep your ad hammering weekly

In The Iron Trade Review

DROP FORGINGS

Oil Burners, Forges and Crucible Furnaces for Crude Oil Equipment.

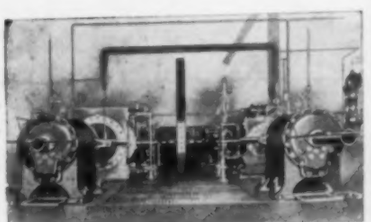
Railway Braces, Railway Track Tools, Forged Steel Picks,

Track Wrenches, Steam Hammer Forgings.

Union Drop Forge Co., 68-70 E. Ohio St., CHICAGO, ILL.

It Pays to Buy
INGERSOLL-SERGEANT
AIR COMPRESSORS
and gain greater benefits of lower cost of operation and maintenance.

THE INGERSOLL-SERGEANT DRILL CO.
CHICAGO, ILL. CLEVELAND, O. BOSTON, MASS.
26 Cortlandt Street NEW YORK
PITTSBURG, PA. PHILADELPHIA, PA. ST. LOUIS, MO.
J 1



CORLISS AIR COMPRESSOR

Complete Air Plants
Installed and Guaranteed by

Write for printed matter

CHICAGO, Monadnock Blk.
ST. LOUIS, Lincoln Trust Bldg.
BOSTON, 13 Pearl St.
PITTSBURG, Park Bldg.
SAN FRANCISCO, 320 Rialto Bldg.

Rand Drill Company

THE IRON TRADE REVIEW

VOLUME XXXVII — CLEVELAND, OHIO, MARCH 17, 1904. — NUMBER 11

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The past week has brought a scale of activity in certain iron and steel lines that has not been equaled in months, and the entire market has taken on new life. The lowest priced products, pig iron and steel bars, have had a lion's share of attention, but the movement has been good also in other lines, in which special influences were not strongly operative. Both foundry and Bessemer irons have advanced, and of the latter there is now little available in the Pittsburg and Valley districts for delivery before May.

The Steel Corporation exercised its option on March 9 on 50,000 tons of Bessemer iron for April delivery, included in its original deal with the merchant furnaces. It has developed, also, that the Republic Iron & Steel Co. bought 60,000 tons of Bessemer just prior to the Steel Corporation purchase. The merchant furnaces have advanced their price to $13.25 at furnace and $13.50 is the minimum with some. Coke has advanced 15 to 25 cents a ton and car shortage has played no small part in the operations of the week, with the prospect that a firm fuel market will prevail until well into the spring, even though there be no bituminous coal strike. The miners' votes thus far reported give almost certain assurance that this menace is removed.

Buying of foundry iron has been relatively heavy in the past 10 days, and the movement of prices has led a good many consumers to stir themselves. Some of the largest of melters have bought for second quarter delivery, but early needs are covered by the bulk of the buying. A February reduction of nearly 50,000 tons in stocks at furnaces apart from those of steel companies was considered significant of a greater consumption than has been credited; and when this happened in the face of an increase in the rate of pig iron production from 10,150,000 tons a year on Jan. 1 and 14,700,000 tons a year Feb. 1 to 16,500,000 tons a year March 1, the character of the change that had come over the industry began to be appreciated. Pig iron production now is at practically the same rate as in March, 1902, which was considered at the time as belonging to the era of prosperity. Southern sellers have been active in the past 10 days, and whereas a week ago most of them had come up to $9.25 for No. 2 iron, after selling freely at $9, the minimum is now $9.50, while $10 is reappearing as a desired price, but not one at which business is done. Northern irons are stronger, and $12.50 at furnace is now the usual minimum for No. 2, with $13 more frequently quoted. The general run of foundry buyers have not yet followed the pipe and radiator and other specialty lines in covering for the first half. At last the Pennsylvania tunnel castings are a real factor in the market, inquiries having come from various sources. The needs for the next year on this account will be about 100,000 tons of pig iron.

The finished material market still gets along with only moderate support from the railroads. Business that will come with the spring is talked about; but the principal basis of the upturn of the past week is agricultural implement and machinery requirements. The expected advance in steel bars came on Monday. It is $1 a ton and is confined to Bessemer bars. Previously consumers were given opportunity to contract at the old price and 125,000 tons or more was booked by Pittsburg and Western mills. Bar iron is also stronger and the recent advance of $1 has been followed by another. Pittsburg is now basing point on Western business, freight being added to 1.35c. With only a fair demand from railroads added to what they now have booked the mills would quickly pass to a scale of operations little dreamed of in the quiet days of January. Plate and structural lines still have room for large improvement, but there has been betterment in the past fortnight.

The wage situation in sheet and tin plate mills is critical. Scale rates have been cut by consent of the men in a number of cases and the Amlagamated Association, confronted by the leading producer with evidence of special concessions to independent mills, has hastily called a meeting of its executive board. Lower wages all along the line are in prospect, if not a serious break in the union's lines.

The cotton tie market for 1904 has opened after much conferring by the three producers and 75 cents a bundle in 5,000-bundle lots is the basis, as against 85 cents last year. Hoops and bands are firmer, in line with the advance in bars.

PITTSBURG.

(Special Telegram.)

PITTSBURG, March 16.—The cotton tie market has at last been opened after several meetings of the three manufacturers of ties. In 5,000-bundle lots and over 75 cents per bundle is quoted and on less than 5,000-bundle lots the price is 80 cents. Since the first meeting of the manufacturers, when a price of 70 cents was discussed the general iron and steel market has strengthened greatly and the 75 and 80 cent basis is the result. The total consumption of ties amounts to about 50,000 tons annually. Last season's prices were 85 and 88 cents, and when the season was almost over prices were advanced to 88 cents for 5,000-bundle lots and 91 cents for less than 5,000 bundles.

Hoops and bands are stronger since the advance in bars. Bands are now held at 1.35c base, taking the usual bar extras, and hoops are strong at 1.40c to 1.45c.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, March 16.

The United States Steel Corporation last Thursday exercised its option on an additional 65,000 tons of Bessemer iron for April delivery, making the total purchases up to date about 150,000 tons. On April 10, options expire on iron for May delivery, but the company has the right to cancel at that time all undelivered iron on previous purchases. Few of the furnaces will be in position to deliver all of the iron contracted for during March owing to the difficulties experienced in securing coke. Should all options be exercised on iron optioned for May delivery, the total purchase of the Steel Corporation will amount to fully 200,000 tons. It now appears that the Republic Iron & Steel Co. purchased about 60,000 tons of Bessemer iron a few weeks before the purchase of the United States Steel Corporation was announced. Some of this iron is for delivery in the first half of the year, while the remainder is contracted for delivery later in the year. A large portion of this iron was bought at $12.50, for first half delivery, Valley furnace, another block being placed at a somewhat higher price. Some undelivered high priced Bessemer iron contracted for by this concern had its influence on the deal, and there was some additional iron arranged for on an ore conversion basis. The contracts with the Republic Iron & Steel Co. and the Steel Corporation have cleaned up practically all of the available Bessemer for the remainder of March and the month of April and for prompt delivery Valley furnaces are quoting $13.50 for small lots. Northern forge and foun-

dry have also advanced, the usual price on forge now being $13.25, Pittsburg, while on No. 2 foundry the better grades are commanding from $13.75 to $13.85. Southern furnaces have also stiffened up and there are no offerings of No. 2 below $9.50, Birmingham, while $9.75 and $10 is being quoted by several Southern operators.

On Monday the steel bar manufacturers in session in this city advanced Bessemer bars $1 per ton, but no change was made in open-hearth. The bar iron interests in this district decided on a $2 advance and are now quoting common iron bars at 1.45c, Pittsburg. The bar iron base has also been changed from Youngstown to Pittsburg, and on shipments to Western points 1.35c, Pittsburg, is quoted, plus freight to point of destination, making the Chicago delivered price 1.50c. In the East bar iron has stiffened considerably. Orders for steel bars amounting to over 100,000 tons have been placed with local mills in the last ten days, deliveries running through the remainder of the year, while in a few cases requirements have been covered until April 1, 1905. The plate market continues quiet, although structural steel is brightening up somewhat. Demand for pipe and wire products continues very heavy.

A crisis in the sheet and tin plate trades so far as the Amalgamated Association of Iron, Steel and Tin Workers is concerned is impending. The sheet and tin plate lodges are now voting on a proposition of holding a special convention to consider the situation and so grave has the general condition grown in the past few days that a special session of the executive board of the asscociation has been called for Thursday morning in this city. In the meantime the Amalgamated Association members employed in the Ætna-Standard sheet mill of the American Sheet & Tin Plate Co. returned to work today at a reduction of 10 percent, which is in addition to the reduction of 10 percent which went into effect on Jan. 1, when the limit of output was also increased. It is alleged by officials of the American Sheet & Tin Plate Co. that there have been gross violations of the sheet and tin plate scale in independent mills and they want to be granted the same privileges.

The shortage of cars has seriously affected the delivery of coke from the Connellsville region to furnaces and foundries. The shippers are securing about half their daily requirements of cars, and furnace operators in several instances have had to pay premiums to secure prompt coke in order to prevent banking their fires. The H. C. Frick Coke Co. has figured prominently as a buyer of prompt coke in the past week, as not sufficient coke can be shipped out of the region from its own plants on account of the car shortage to keep some of the stacks from banking. The railroads promise a better car supply as soon as the weather moderates, and while the weather has considerable to do with the present situation there is little doubt that the railroads are sadly in need of additional cars but will not buy owing to their retrenchment policies.

Pig Iron.—Most of the foundries and iron mills have covered their requirements for the next few months as noted last week and the market has been comparatively quiet during the past few days. The heavy buying of steel interests however has greatly stiffened the market and Northern forge is held at $13.25, Pittsburg, while No. 2 foundry is quoted at $13.75 to $13.85. We note one sale of 500 tons of forge at $13.25, Pittsburg, while scattering lots of No. 2 foundry have been placed at prices ranging from $13.75 to $13.85. Bessemer is now held firm at $13.50, Valley furnace, although this price might be shaded for extended delivery. It is now believed that during the coming season of navigation the tonnage of ore to be brought down will considerably exceed 13,000,000 or 14,000,000 tons to which some of the ore operators want the output limited. The extensive fleets of some of the steel producers could not operate for the full season on the smaller output, and some of the independent producers likewise are interested in vessel property, which they will want to employ to the fullest extent possible. Of course the independent producers take the stand that unless there is a material reduction in ore prices there will not be much buying and that it will be impossible to bring down the larger tonnage and prevent its accumulation on lower lake docks unless the prices as they have formulated them will be adopted. We make the following quotations:

Bessemer, Valley	$13 25 to 13 50
Bessemer, Pittsburg	14 10 to 14 35
No. 1 Foundry	14 00 to 14 25
No. 2 Foundry	13 75 to 13 85
Gray forge, Pittsburg	13 25
Cnilled basic, Valley	12 75 to 13 00
Chilled basic, Pittsburg	13 60 to 13 85

Steel.—The demand for billets and sheet bars has improved considerably in the past week and agreed quotations are not being shaded to any extent by outside mills, while the parties to the agreement claim to have no difficulty in securing scheduled prices. We make the following quotations: Bessemer and open-hearth billets, 4 x 4 inches, and slabs, up to and including 0.25 carbon, $23, Pittsburg, Wheeling, Valley, Johnstown, Ashland, Ky., Ironton, O., and Lorain, O., 0.26 and including 0.60 carbon, $1 advance; and 0.61 to 1.00 carbon, $2 advance. Billets smaller than 3⅞ inches and sheet and tin bars are $1 per ton extra. Bessemer and open-hearth rods are still quoted at $30, Pittsburg.

Ferro-Manganese.—Demand for ferro is picking up with the resumption of operations at a large number of steel mills throughout the country, and the market is firm at $43 for carload lots delivered at any point east of the Mississippi.

Spelter.—The market is strong with prime Western grades at 4.95c to 5c, Pittsburg, in carload lots.

Muck Bar.—There is little demand for muck iron and the price is unchanged at $26, Pittsburg, for neutral bars.

Skelp.—Both iron and steel skelp are firmer than for some time, due to enlarged demand and the strengthening of the iron and steel bar markets. Grooved steel skelp is quoted at 1.40c to 1.45c and sheared at 1.50c; grooved iron, 1.50c to 1.55c and sheared at 1.60c.

Rails and Track Material.—Demand for light rails is only moderate and low prices are still ruling. While the rail mills rolling standard sections are on in full except the Ohio plant, the tonnage now booked is far from sufficient to carry them through the year. We make the following quotations: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; 16 to 40 pounds, $23 to $24. Track material: Spikes, 1.65c to 1.70c.

Sheets.—There was no meeting of the independent sheet manufacturers at Columbus, O., as reported. At the time the meeting was supposed to have been held President Campbell and Secretary Nutt were at Youngstown, O., attending conferences with the Amalgamated Association. Demand for sheets is improving although considerable shading is reported. Black sheets, one pass through cold rolls, are quoted as follows: No. 8, 1.80c to 1.85c; No. 9, 1.85c to 1.90c; Nos. 12-14, 1.95c; Nos. 15-17, 2c; Nos. 18-21, 2.05; Nos. 22-24, 2.10c; Nos. 25-26, 2.15c; No. 27, 2.20c; No. 28, 2.30c; No. 29, 2.60c; No. 30, 2.70c. Galvanized: Nos. 12-17, 2.40c; Nos. 18-21, 2.55c; Nos. 22-24, 2.70c; Nos. 25-26, 2.90c; No. 27, 3.10c; No. 28, 3.30c; No. 29, 3.70c; No. 30, 4.10c.

Plates.—The demand for plates is not heavy, but steel car plants in this district intend to resume operations about April 1, when plate specifications will no doubt increase. Prices remain unchanged as follows: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches, 5c extra 100 pounds. Plates 3-16 inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

Bars.—At a meeting of the steel bar manufacturers held here on Monday, March 14, Bessemer bars were advanced $1 per ton. No advance was made in open-hearth. During the last ten days large consumers of steel bars have been placing contracts for deliveries during the next nine

and twelve months. It is estimated that important steel bar producers in this district have closed upwards of 100,000 tons. Few of the large buyers remain uncovered as it was practically known by all that the advance would be made this week. Iron bars have been advanced $2 a ton in this district by the largest producers. This is in addition to the $1 advance noted a week ago, making iron bars 1.45c, Pittsburg. The basing point on iron bars has also been changed from Youngstown to Pittsburg, and bars for western shipment are now held at 1.35c, Pittsburg, plus the freight to point of destination, making Chicago deliveries 1.50c. In addition no orders will be taken for delivery beyond July 1, at these prices. The iron mills have all taken heavy tonnages in the past three weeks and the situation in iron and steel bars is better than at any time in the past eight months. We revise quotations as follows: Bessemer steel bars, 1.35c; open-hearth, 1.40c; plow beams and cultivator beams, 1.35c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.45c; common bar iron, 1.45c, Pittsburg, for western delivery 1.35c, Pittsburg is quoted plus freight to point of destination. The following differentials are maintained on steel: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance.

Pipes and Tubes.—Demand for merchant pipe keeps up and the tonnage placed thus far this year exceeds that placed during the same period last year. In addition mill stocks are lower and plenty of business is being offered to keep the mills of the independent producers as well as the National Tube Co. on in full. Discounts to consumers, carload lots f. o. b. Pittsburg, plus freight to destination according to Tube Rate Book, are as follows:

MERCHANT PIPE.

	Steel		Iron.	
	Black.	Galv.	Black.	Galv.
⅛, ¼, ⅜ inch	68	58	66	56
½ inch	71	61	69	59
¾ to 6 inch	75	65	73	63
7 to 12 inch	71	61	68	58
Ex. Stg., plain ends, ⅛ to 8 in.	67	57	64	54
Double Ex. Stg., pl. ends, ½ to 8 in.	59	49	56	46

BOILER TUBES.

	Steel.	Iron
1 to 1½ inch	42½	39
1¾ to 2¼ inch	55½	38
2½ inch	58	43
2¾ to 5 inch	64½	50½
6 to 13 inch	55½	38

Structural Material.—Specifications on structural material are being received more freely by all the mills and several large mills that have been idle for several months are operating this week on accumulated orders. Quotations remain unchanged as follows: Beams and channels, 3 to 15 inches are quoted, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles, from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

Wire and Wire Nails.—Demand for wire and wire products continues unabated and the situation in the wire trade is already assured until July 1. Demand for cut nails is much better and the big disparity between the price of wire and cut nails in favor of the latter has resulted in the receipt of heavy orders by the cut nail manufacturers. We make the following quotations: Wire nails, carload lots to jobbers, f. o. b. cars Pittsburg, $1.90 base, plain wire, carload lots $1.80 base; barb wire, carload lots, $2.20, base; staples, carload lots, $2.05, keg. Galvanized, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel and iron cut nails, carload lots, $1.70, and less than carload lots, $1.75, f. o. b., Pittsburg, plus freight to point of destination. Terms, 60 days, less 2 percent off in 10 days.

Merchant Steel.—There is a continued improvement in the demand for merchant steel and the shafting market continues to show improvement. We make the following quotations: Cold rolled and ground shafting 52 off in carload lots and 47 percent off in less than carload lots. Tire steel, 1.50c, base; spring steel, 1.90c to 2c; toe calk, 1.85c, base. Tool steel is quoted 6 cents and upwards, according to the grade.

Old Material.—The heavy buying of No. 1 wrought scrap by one of the largest iron interests in the country during the month of December has resulted in a practical shortage of this material at the present time. No. 1 wrought, free from steel is held at $17.50, Pittsburg, gross tons, and a few dealers are holding their material at $18. Heavy low phosphorus melting stock such as crop ends, etc., is held at $17, Pittsburg, in gross tons while lighter scrap is held at $14.50. New melting stock is firm at $14 to $14.50, gross.

Coke.—Prompt furnace and foundry coke is now commanding a premium owing to the shortage of cars in the Connellsville region. Few of the shippers are securing more than half of their requirements, and the H. C. Frick Coke Co. has had to go into the open market on several occasions in the past ten days to secure prompt coke to prevent some of the steel corporation furnaces from banking. High grade Connellsville foundry coke for fairly prompt delivery is held at $2.40 to $2.50, while furnace coke is held at $1.65 to $1.75. During the week ending Saturday, March 5, there were 16,520 ovens active and 6,465 idle in the upper Connellsville region and the output is estimated at 183,799 tons. In the lower region there were 4,501 ovens in operation and 1,144 idle and the output amounted to 52,834 tons.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, March 15.

Evidence is not wanting in this market that iron and steel products have a substantial basis for an upturn in prices. The tendency which has been noted for the past month in most finished materials, has at last appeared farther down, and there is now $1 a ton difference between the lowest recent price on Southern pig iron and the price at which it is now being offered. The principal Southern producers are heavily loaded on the most popular grades and some of them have withdrawn on No. 2 soft and No. 3 foundry. It is not to be understood that furnaces which sold iron last week at $9 are selling this week at $10. Those interests are generally on the $9.50 basis, while producers who declined to meet the $9 competition but remained at $9.25 and $9.50 have advanced their prices to $10 Birmingham. This advancing market has resulted, as it invariably does, in a buying movement of no small proportions, and inquiries from all classes of iron consumers show a heavy increase both as to volume and tonnage. It has been anticipated for some time that the consumption of iron would be much heavier in the second quarter than during the first three months, and from the tonnage sold thus far, this expectation is in a fair way to be realized.

In finished materials, there is little change to report. Plates are improved, the local mill having received sufficient specifications to start up again. Track supplies are also very active, and light rails are bringing better prices than a few weeks ago. Heavy rail sections are quiet. Specifications come in well but there are no important new sales. A good daily business is transacted in sheets, and local producers report no trouble in getting 2.46½c Chicago for No. 28 gauge. Steel hoops have advanced to 1.56½c Chicago, and mills are booking considerable tonnage in this market at this figure.

The buying of iron and steel bars continues heavy, and local mills are maintaining the 1.50c quotation for iron. Steel is very firm and an advance of $1 a ton has been made this week, following good contracting, buyers being notified of the intended advance. The agricultural trade has bought heavily within the last few weeks for deliveries extending throughout the year; and railroads have also been covering for their requirements in bar iron quite freely. Boiler tubes are slowly improving, though the demand is far from what might be called good. Merchant pipe is very active, as also is cast iron pipe, some good business having come in for both during the past week.

The situation in scrap is still an unsatisfactory one to both dealers and consumers. All winter prices have been

regarded too high by the latter in comparison with the costs of pig iron and the finished product, but dealers have shown no disposition to reduce them and have preferred not to sell unless at their own prices. Country merchants are reported to have considerable material stocked in their yards, and an easier market is anticipated as soon as the snow is off the ground.

Pig Iron.—The week has seen a marked change in the local pig iron situation. Prices are higher, demand is better and the market has a snap and vigor it has not felt before this year. The minimum at which Southern No. 2 foundry is now selling in this market is $9.50 Birmingham, while some furnaces are asking $9.75 and others as high as $10. Northern irons are also stronger, and are generally held on the basis of $13.50 Chicago for No. 2, with a firm tendency upward. There was a good volume of buying in the past week, during which prices rapidly advanced from the low plane of $9.00, at which they were selling on Monday and Tuesday. Yesterday, one leading Southern interest advised its agents to advance prices to $10 and to withdraw from the market on No. 2 soft and Nos. 3 and 4 foundry. Another large maker in the Birmingham district is also holding its product at $10 and additions to this class are expected before the end of the week. Lake Superior charcoal is unchanged at $15 Chicago, and malleable Bessemer is held at $13.75, though a good sized order could undoubtedly be placed at a slightly better price. The buying during the week has been in average sized lots, ranging down from 1,000 tons and covering requirements for the second quarter. Lower grade irons have been in active request, and some good sales are reported. We have revisd our prices and quote:

Lake Superior Charcoal	$15 00 to 15 50
Northern Coke Foundry No. 1	14 00 to 14 25
Northern Coke Foundry No. 2	13 50 to 13 75
Northern Coke Foundry No. 3	13 00 to 13 25
Northern Scotch Foundry No. 1	14 50 to 14 75
Ohio Strong Softeners No. 1	15 30 to 15 80
Ohio Strong Softeners No. 2	14 80 to 15 30
Southern Coke Foundry No. 1	13 85 to 14 35
Southern Coke Foundry No. 2	13 35 to 13 85
Southern Coke Foundry No. 3	12 85 to 13 35
Southern Coke Foundry No. 4	12 60 to 12 85
Southern No. 1 Soft	13 85 to 14 35
Southern No. 2 Soft	13 35 to 13 85
Southern Gray Forge	12 10 to 12 60
Southern Mottleu	1f 85 to 12 35
Southern Silveries (4% to 6% Silicon)	14 85 to 15 35
Jackson Co. Silveries (8% to 10% Silicon)	17 80 to 18 30
Alabama and Georgia Car Wheel	19 85
Malleable Bessemer	13 75 to 14 00
Basic Iron	13 60 to 13 85

Iron and Steel Bars.—Demand continues without diminution, and both iron and steel producers report that the local market is very strong. The meeting held this week by the leading steel producers to consider an advance in steel bars, resulted as expected, in putting up the price $1 a ton. Local iron mills report they are selling their output without difficulty on the basis of 1.50c Chicago. Car builders, implement makers and wagon manufacturers are the heaviest buyers. Steel hoops are now firmly established on the basis of 1.56½c Chicago, and there is a good buying at this price. We quote mill shipments, Chicago delivery, carload lots, as follows: Bar iron, 1.50c, half extras; soft steel bars, 1.51½c, half extras, with 5c to 10c per 100 pounds extra for less than carload lots with the regular extras for less than a ton of a size; angles, less than 3 x 3, 1.56½c base, half extras; hoops, 1.56½c, full extras. On lots from store we quote iron bars, 1.60c to 1.70c base, full extras; steel, 1.60c to 1.75c, half extras; small angles, channels and tees, less than 3 x 3, 1.70c to 1.85c, rates, half extras; hoops, 1.75c to 2c.

Billets.—There have been some sales of forging billets during the week at association prices, but the market is generally without interest. Reports are current that lower prices are being made, but these cannot be confirmed and are published for what they are worth. We quote Bessemer and open hearth billets for rerolling or forging work, up to .25 carbon, $24; up to and including .60 carbon, $1 extra; over .60 carbon, $2 extra. Billets for working into axles, $25 Chicago. Open hearth billets in small lots from store, 1.30c per 100 lb.

Sheets.—There is a distinct improvement in the local demand for both black and galvanized sheets and prices are better maintained. The bulk of the buying comes from the roofing trade and the galvanizing interests, who have placed good sized orders in the last ten days. The local producer has advanced its prices to the basis of 2.46½c Chicago, although some mills are shading this price. We quote No. 27 black, 2.36½c to 2.41½c; No. 28, 2.41½c to 2.46½c. Galvanized, No. 27, 3.26½ to 3.31½c; No. 28, 3.36½c to 3.41½c. On small lots from store, we quote black sheets as follows: Nos. 8 and 10, 2.15c to 2.20c; No. 12, 2.20c to 2.25c; No. 14, 2.30c to 2.35c; No. 16, 2.40c to 2.45c; Nos. 18 and 20, 2.50c to 2.55c; Nos. 22 and 24, 2.55c to 2.60c; No. 26, 2.65c to 2.70c; No. 27, 2.75c to 2.80c; No. 28, 2.80c to 2.85c; No. 29, 2.95c to 3c; No. 30, 3.10c to 3.25c. Galvanized, 75 and 7½ percent.

Structural Steel.—The market is without interest, specifications on contracts being about the only business coming forward. Prices are unchanged, and we quote carload lots, mill shipments, Chicago delivery, as follows: Beams and channels, 16 inches and under, 1.76½c; 18 inches and over, 1.86½c; universal plates, 1.76½c; angles, 3 x 3 and larger, 1.81½c; zees, 1.76½c. On lots from store, we quote beams, channels and angles, 3 x 3 and larger, 1.90c; 18, 20 and 24-inch, 10c extra; tees, 1.95c rates.

Plates.—Business improved during the past week to a volume warranting the starting up of the plate mill at South Chicago, and an effort will now be made to keep this mill in operation constantly. Prices are unchanged, and we quote on carload lots, mill shipments, Chicago delivery, as follows: Tank steel ¼ inch and heavier, 1.76½c; flange steel, 1.86½c. From warehouse, we quote small lots: Tank steel, ¼ inch and heavier, 1.90c to 2c; 3-16, 2c to 2.10c; No. 8, 2.10c to 2.20c; No. 10, 2.15c to 2.25c; flange steel, 2.25c, all f. o. b. warehouse.

Rails and Track Supplies.—A good tonnage has been closed in both track supplies and light rails, the latter being taken at higher prices than were current a few weeks back. Standard sections are quiet. We quote heavy rails, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality, rails, $27; 25-pound rails, $25 to $26; 12-pound rails, $26 to $28, with regular differentials for intermediate sizes. The following quotations on track supplies, which are f. o. b. Joliet mill, may be shaded on large orders: Angle bars, 1.40c to 1.50c; spikes, first quality, 1.70c to 1.80c (out of store, 1.90c rates); track bolts, 3½ x ¾, with square nuts, 2.40c to 2.50c per 100 pounds; with hexagon nuts, 2.55c to 2.65c, with usual differentials for other sizes.

Merchant Steel.—Business from the agricultural trade is of fair volume and specifications are also coming in freely. The situation is one of strength and prices are firm. We quote carload lots, mill shipments, Chicago delivery: Spring steel, 2c; sleigh shoe, flat sizes, 1.60c; concave and convex, 1.75c; cutter shoe, 2.25c to 2.30c; smooth finished machinery steel, 1.71½c base; plow steel, 2.30c and upwards, according to quality; toe calk, 2.01½c to 2.11½c. Ordinary grades of tool steel, 6c to 8c; specials, 12c and upwards. Cold rolled shafting, in carload lots, 52, and in less than carload lots, 47 percent discount from list.

Merchant Pipe.—The tonnage taken during the week has been of large proportions, both consumers and jobbers laying in ample stocks for the spring trade. We have revised our prices, and quote carload lots, mill shipments, random lengths, f. o. b. Chicago, as follows:

	Steel Pipe.		Guar. Wrought Iron.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ⅜ inch	66.35	56.35	64.35	54.35
½ inch	69.35	59.35	67.35	57.35
¾ to 6 inches	73.35	63.35	71.35	61.35
7 to 12 inches	69.35	59.35	66.35	56.35

Less than carloads, 12½ per cent. advance.

Boiler Tubes.—In sympathy with the quiet condition of plates, business in boiler tubes is of restricted proportions, although the demand is slightly better than a week ago. Jobbers report a good inquiry, but that the business from same is not correspondingly large. We quote carload lots, f. o. b. Chicago, as follows:

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	43.35	40.85	53.35
1¾ to 2¼ inch	55.85	38.35	40.35
2½ inch	58.35	43.35	.....
2¾ inch to 5 inch	64.35	50.85	Up to 4 inches.
6 to 13 inch	55.85	38.35	48.35

For car lots or less, direct from warehouse stock:

	L. W. Steel. Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	40	35	37.50
1¾ to 2½ inch	50	32.50	35
2¾ to 5 inch	60	45	Up to 4 inches.
6 to 13 inch	50	32.50	45

Cast Iron Pipe.—The only order of interest closed during the past week was one from a Milwaukee concern for 2,000 tons. The balance of the week's sales was made up of small lots, which aggregated a good sized tonnage. Prices are 50 cents a ton lower, and we quote carload lots, Chicago delivery: 4-inch water pipe, $26; 6-inch to 12-inch, $25; larger sizes, $24; gas pipe, $1 a ton higher.

Wire Products.—The leading producer has difficulty in getting sufficient cars to handle its output, and some consignments have been delayed on this account. Otherwise the market is without appreciable change. The demand continues of good proportions. We quote carload lots to jobbers, Chicago delivery, as follows: Wire nails, carload lots, $2.10; less than carload lots, $2.15; cut nails, carload lots, 1.86½c base; less than carload lots, 1.91½c; smooth wire, carloads, $2, and $2.05 for less than carload lots; galvanized smooth wire, $2.30 in carloads, and $2.35 in lesser amounts; painted barbed wire, $2.40 carloads, and $2.45 in less than carload lots; galvanized barbed wire, $2.70 carloads, and $2.75 less than carload lots. Staples, polished, carloads, $2.25; less than carload lots, $2.30; galvanized, $2.55 carloads, and $2.60 less than carload lots. Bale ties, 82½ and 5 percent discount, f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Foundry Coke.—The scarcity of cars in the Connellsville region and the delays to shipments en route have markedly stiffened the local market, and selected Connellsville 72-hour coke is firm at $4.90 to $5.15 Chicago. Southern grades are somewhat easier and prices are lower with a freer offering of material. Spot fuel is scarce and hard to obtain.

Old Material.—Transactions have been of a quiet order during the past week. Mills are buying only such materials as they are actually in need of, and foundries are scarcely a factor in the local situation from a buying standpoint on account of the cheapness at which low grade pig iron has been selling. Dealers are standing to their prices firmly, preferring to hold their material rather than sell at less than they consider it is worth, and in consequence a majority of them have accumulated stocks in their yards. Old iron rails and car wheels are 25 cents a ton higher than a week ago, while dealers' forge, cast borings, wrought, machine shop, iron axle and steel axle turnings are from 25 to 50 cents a ton lower since our last report. We have revised our prices, and quote dealers' selling prices, gross tons as follows:

Old iron rails	$16 25 to 16 75
Old steel rails (mixed lengths)	11 50 to 12 00
Old steel rails (long lengths)	13 00 to 13 50
Relaying rails	23 00 to 24 00
Old wheels	12 75 to 13 25
Heavy melting steel	11 50 to 11 75
Mixed country steel	9 50 to 10 00

The following are selling prices for net tons:

Low phosphorus scrap (.04 and under)	12 00 to 12 50
No. 1 R. R. wrought	13 00 to 13 50
No. 2 R. R. wrought	11 50 to 12 00
Shafting	13 50 to 14 00
Dealers' forge No. 1	9 75 to 10 25
No. 1 busheling and wrought pipe	8 50 to 9 00
No. 1 cast	11 50 to 12 00
Heavy cast (300 pounds and over)	8 50 to 9 25
Agricultural malleable	9 00 to 9 50
Iron axles	16 50 to 17 00
Steel axles	15 00 to 15 50
No. 1 boilers, cut	8 50 to 9 00
Cast borings	5 00 to 5 50
Mixed borings, etc.	5 00 to 5 50
Wrought turnings	7 25 to 7 75
Machine shop turnings	7 25 to 7 75
Iron axle turnings	8 00 to 8 50
Steel axle turnings	8 00 to 8 50
Stove plate and light cast scrap	9 50 to 9 75
Old iron splice bars	13 00 to 13 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, March 15.

The improved conditions noted last week continue and are more pronounced. No one is expecting boom times and there is a general disposition not to count too confidently on the improvement continuing, but the tone of the market is much stronger and prices are tending upward.

Iron Ore.—The chartering of two vessels to carry 16 cargoes of ore from ports at the head of Lake Superior to Tonawanda at 90 cents, a reduction of 10 cents compared with last year, is reported. Some chartering of cargoes of coal for upper lake ports has also been done at rates which prevailed toward the close of last year's season. These are the first signs of activity in lake business, but they do not decide what the rates on ore will be and it is not probable that the latter will be determined for some time. The Pittsburg Steamship Co. will be able to take care of the ore of the United States Steel Corporation and will not be the prime factor in establishing the rates, as it has done for several years. The present outlook is that there will be no serious labor trouble this year on the lakes. The unions apparently recognize that they can not demand the wages of last year with any prospect of having them granted. Although June 1 has frequently been mentioned as the probable date for the opening of navigation, it is now expected that many vessels will start on their first trips by May 1.

Pig Iron.—It is estimated that the work on the Pennsylvania Railroad tunnels at New York will require from 250,000 to 300,000 tons of iron. While it is not probable that foundries in this city will be an important factor in the competition for contracts for castings to be awarded by the general contractors, one Cleveland foundry has sent out an inquiry for 25,000 tons contingent upon its obtaining a contract for tunnel castings, deliveries to begin in August and to be made at the rate of 100 tons per day. Bessemer iron is firm and while some furnaces decline to sell below $13.50, the usual quotation is $13.25 at the furnace. Cleveland furnaces are delivering iron in the city at $13 for No. 2 foundry or $12.75 at the furnace. In the Valley, some furnaces are holding for $13 for No. 2 while others are selling at $12.50. A considerable tonnage has been sold within a few days. Southern irons are firmer and while it is probable that some iron can be had at $9.75, Birmingham, for No. 2, several companies have advanced to $10 for No. 2 and $8.75 for gray forge. Southern furnaces have made large sales during the past ten days and some of them are not anxious to sell for delivery after April. Deliveries on some sales already made will not be completed until September. We quote as follows for Cleveland delivery, save on Northern gray forge, which is at Valley furnace:

Bessemer	$14 10 to 14 35
No. 1 Strong Foundry	13 40 to 13 65
No. 2 Strong Foundry	13 00 to 13 25
No. 3 Foundry	12 15 to 12 50
No. 2 Southern	13 60 to 13 85
Gray Forge, Valley furnace	12 00 to 12 50
Gray Forge, Southern	12 25 to 12 60
Lake Superior charcoal	15 00 to 15 50

Finished Material.—The price of steel bars has been advanced to from 1.30c to 1.35c for Bessemer, but open-hearth remains at 1.40c. As it was well understood in the trade that this advance would be made March 14, buyers in this locality and pretty generally throughout Ohio bought freely and orders for a very large tonnage were placed. These orders in many cases cover requirements of the purchasers for the year. Reports brought to Cleveland by traveling sales agents indicate that the demand for steel bars has not been uniform, buyers in some localities showing much more interest and inclination to place orders than those elsewhere. On the whole, however, sales have been very satisfactory. The new price of bar iron announced last week, 1.35c, Pittsburg, is being adhered to by the principal producers, and sales are limited. A disturbing factor in the bar iron market for a long time has been the disposition of the mills in Indiana to sell at

prices considerably below those of the principal producer. These mills are now advancing their quotations. One of the Indiana companies writes *The Iron Trade Review* as follows: "We had some very low priced orders, but we are just cleaning them up and aside from about 1,500 tons taken at low prices, our business is all based on 1.30c and 1.35c, Pittsburg, tariff rate added to destination. We are not in the business for our health and are doing everything in our power to maintain prices, which we believe, are in harmony with what we understand the situation to be in your district. We have not at any time been where we could be classed with the Indiana mills that have sold bar iron at 1.20c basis and we sincerely hope that we will conserve our own and our competitors' interests to the end that present prices may not be reduced and that even a reasonable increase over same may be secured. We are turning out about 150 tons per day of finished product at the present time."

It is estimated that the Pennsylvania R. R. tunnels will require 25,000 tons of plates and 10,000 tons of steel castings. The principal producer of hoops is holding for 1.40c and there is no positive evidence that competitors have sold for less. The sheet business continues to improve, and while official quotations have not been advanced, there is less disposition to make concessions. Prices of the principal producer through jobbers are as follows: Mill sales of black sheets, No. 10, 1.75c; No. 11-12, 1.80c; No. 14, 1.85c; No. 16, 1.95c; No. 27, 2.20c; No. 28, 2.30c. Galvanized, 80, and 3 off. Out of stock prices are as follows: No. 10, 2.10c; No. 12, 2.15c; No. 14, 2.20c; No. 16, 2.30c; No. 18-20, 2.40c; No. 24, 2.45c; No. 25-26, 2.50c; No. 27, 2.55c; No. 28, 2.65c; No. 30, 3.10c. Galvanized out of stock, 75, 10 and 5 off.

Old Material.—Railroads are offering more freely, but scrap is still scarce and prices are firm. Heavy steel has advanced about $1. We quote as follows for gross tons, Cleveland:

Old iron rails	$16 00 to 17 00
Old steel rails (over 6 feet)	13 50 to 14 50
Old steel rails (6 feet and under)	13 00 to 14 00
Old car wheels	13 00 to 14 00
Steel boiler plates	9 00 to 10 00
Malleable iron (railroad)	11 00 to 12 00
Malleable iron (agricultural)	9 00 to 10 00
Heavy steel	13 00 to 13 25

We quote the following net tons:

No. 1 R. R. wrought	$12 00 to 13 00
No. 1 busheling	11 00 to 12 00
No. 1 machine cast scrap	11 50 to 12 00
Iron axles	16 50 to 17 50
Axle turnings	9 00 to 10 00
Wrought turnings (free from cast)	7 50 to 8 25
Uncut wrought iron boilers	5 00 to 6 00
Grate bars	8 00 to 9 00
Pipes and flues (clean)	10 00 to 11 00
Tank iron	9 00 to 10 00
Hoop and band iron	5 00 to 6 00
Sheet iron	4 00 to 5 00
Wrought drillings	7 00 to 8 00
Stove Plate	9 50 to 10 50
Steel axles	13 00 to 14 00
Cast borings	4 50 to 5 50

The E. D. Rogers Co., Garfield building, Cleveland, will be agent for the Worth Bros. Co., Interstate Steel Co., Allegheny Steel & Iron Co. and the Independent Rolling Mill Co., which started its plant at Cuyahoga Falls O., in operation March 15.

CINCINNATI.

March 15

In the coke trade there is now more trouble to get shipments on contracts than at any time this winter. A scarcity of cars is given as the cause. Good coke for prompt shipment is commanding a slight premium. The coke demand on the whole is better, however, and the market is slightly stronger. Coke for prompt delivery is quoted at $2.25 to $2.50 f. o. b. ovens, while contracts for future delivery are being made at $2 to $2.25 at the ovens for foundry coke. A contract was made this week covering a year's supply to a large consumer in Louisville, Ky., involving about 500 tons per month, but the price was not made public.

Pig Iron.—The heavy buying has given the market more strength and there is an advance in quotations. One of the most important Southern furnace interests has put up its prices to $10 Birmingham for No. 2 foundry as a basis and has actually turned down business at $9.50. A number of fairly large sales have been made in the week. It is reported that a large cast iron pipe concern took on 25,000 tons, and 10,000 tons of gray forge was sold by one agency to rolling mill interests at $8.25 Birmingham. Further transactions reported are 5,000 tons No. 4 foundry at $8.50 Birmingham, 4,000 tons No. 3 foundry at $8.75 Birmingham, 1,000 tons basic at $10 Birmingham, 2,000 tons No. 3 foundry at $8.75 Birmingham. Pig iron merchant interests have also been heavy buyers up to $9.50 Birmingham, but at anything above that figure this class of buying has halted. The Northern furnaces are also reported to be maintaining a firmer basis of values and it is difficult to shade $12.50 furnace for No. 2 foundry. Heavy sales of mill irons have taken a large part of the available tonnage of gray forge out of the market and No. 2 soft iron is also reported as scarce. There is a fairly good share of the Southern iron sold this week finding its way into the East. Virginia furnaces have been rather firm in their views and have not followed the market down when others went to $9 Birmingham, and it has been suggested that more Southern iron is finding its way into Eastern territory than usual under the price inducement. Consumers in this territory are not conspicuous in the buying and there is a feeling in some quarters that the present advance is only a temporary one. Traveling men report some slight improvement in consumption among the foundry interests but nothing of an important nature. The merchant pig iron interests who have bought this week are always in the market when prices seem to look like bottom has been reached and it seems to be fairly well established now in the minds of the trade that $9 Birmingham is the stopping point for all breaks in prices. Current prices f. o. b. Cincinnati are:

Southern Foundry No. 1	$12 75 to 13 25
Southern Foundry No. 2	12 25 to 12 75
Southern Foundry No. 3	11 50 to 12 00
Southern Foundry No. 4	11 25 to 11 50
Southern Foundry No. 1 soft	12 75 to 13 25
Southern Foundry No. 2 soft	12 25 to 12 75
Gray forge	11 00 to 11 25
Northern Foundry No. 1	14 15
Northern Foundry No. 2	13 65
Northern Silvery (8% silicon)	16 15 to 16 65
Southern car wheel iron	17 50 to 18 00

Finished Material.—An advance of 5 cents per 100 pounds in Bessemer steel bars represents the only change in the market the past week. Jobbers report the market dull although the advices from mills indicate that they are busy with orders. The jobbing trade so far this month has been quiet and distributers are waiting the opening of spring weather in the hope that improvement will then be shown. Bar iron is quoted at 1.40c f. o. b.. Steel bars are advanced to 1.48c base, half extras, with dealers quoting 1.80c to 1.90c for iron and steel out of store. Galvanized sheets are being quoted at 75 and 10 to 75, 5 and 2½ percent off. We quote black sheets, No. 27, at 2.45c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.80c; No. 27, 2.70c; No. 16, 2.45c; No. 14, 2.35c; No. 12, 2.30c; No. 10, 2.25c. Tank plates are easy and sell out of store at 2c for ¼-inch and 2.10c for 3-16 inch. Beams and channels are quoted at 1.90c to 2c from stock, and angles at 1.90c to 2c for base sizes.

Merchant pipe is quiet and unchanged. There has been a rather moderate business and nothing to occasion comment has occurred in the trade. Carload lots are quoted as follows:

MERCHANT PIPE.
(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜ inch	66.7	56.7	64.7	54.7
½ inch	69.7	59.7	67.7	57.7
¾ to 6 inch, inclusive	73.7	63.7	71.7	61.7
7 to 12 inch, inclusive	69.7	59.7	66.7	56.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ inch	41.2	37.7
1¾ to 2¼ inch	54.2	36.7
2½ inch	56.7	41.7
2¾ to 5 inch	63.2	49.2
6 to 13 inch	54.2	36.7

Old Material.—Dealers report no change in the market so far as prices are concerned but there has not been as much doing as in the recent past and trade is more quiet. Prices to consumers are as follows:

Old No. 1 railroad wrought, net tons	$11 50 to 12 00
Cast machine and foundry, net tons	11 00 to 11 50
Old iron rails, gross tons	16 00 to 16 50
Old steel rails, gross tons	13 00 to 14 00
Old short lengths, gross tons	11 00 to 12 00
Old iron axles, net tons	15 50 to 16 50
Stove plate, net tons	9 50 to 10 50
Wrought turnings, net tons	7 50 to 8 00
Cast borings, net tons	4 00 to 5 00

NEW YORK.

OFFICE OF *The Iron Trade Review*.
ROOM 1909, NO. 150 NASSAU ST., March 15

President Maben, of the Sloss-Sheffield Steel & Iron Co., who has been in New York the past week, said today that the experts were still at work getting details with a view to the merger of his company and the Republic and Tennessee companies. He would not venture an opinion as to the probable outcome of the negotiations. An official of one of the companies says: "The Sloss company doesn't want to buy the Tennessee and Republic companies. The Tennessee doesn't want to buy the Sloss and Republic companies; and the Republic doesn't want to buy the Sloss and Tennessee companies. The question is, therefore, who wants to buy all the companies? I don't think anybody does."

Pig Iron.—Developments of the past week have been almost exclusively confined to Southern irons. Conflicting reports are going the rounds regarding prices. One sales agent for a large company states that yesterday he was notified to raise the price of No. 2 foundry from $9.50 to $10, Birmingham, on all sales for delivery up to July 1, and all other grades in proportion. Yet this company is still quoting $9.50. An official of another large company said that his concern was willing to take orders for any quantity of No. 2 foundry at $9.50 for delivery to July 1. This same official declared that within a day or two offers made by his company at $9.50 were rejected, so he believes the orders must have been placed elsewhere at a lower figure. Another large house states that orders in any quantity can be placed at $9.50. A sale of 2,000 tons of No. 2 foundry was made here yesterday at $9.50, which seems to be the market. Southern irons have had a large sale since March 1 and particularly in the past week. In Northern irons underlying conditions have improved, although sales in this vicinity have not been very extensive. Some sales agents are quoting prices today that represent an advance of about 50 cents per ton over those they named a week ago. As for the outlook there is quite a diversity of opinion. While a slight improvement can be looked for, the majority in the trade expect the market to show little change for the next few months. New York prices are as follows: Northern No. 1 X, $15.25 to $15.70; No. 2 X, $14.50 to $14.95; No. 2 plain, $14.25 to $14.70; Southern No. 1 foundry, $14 to $14.25; No. 2 foundry, $13.25 to $13.75; No. 3 foundry, $12.75 to $13.25; No. 4 foundry, $12.25 to $12.75.

Finished Iron and Steel.—Only an ordinary business has been done in structural shapes during the past week. The large propositions noted in previous reports are still hanging fire, and there is no definite information obtainable as to when they are likely to be closed. It was thought that with the approach of milder weather everything augured well for the building outlook in this city, but at this writing there are some 7,000 bricklayers and 6,000 building laborers on strike, and structural material men are wondering whether there is going to be a repetition of the disagreeable labor conditions of last year. Bars are in good demand, and the advance made in Bessemer steel bars yesterday occasioned no surprise. Sheets are fairly active, with jobbers anticipating some good orders in the near future. Plates are showing a little more animation, and the outlook now is better than it has been since the present year opened. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 1.74½c to 1.80c; flange, 1.84½c to 1.90c; firebox, ordinary, 1.94½c to 2c; refined iron bars, 1.45c to 1.50c; soft steel bars, 1.50c to 1.55c; steel sheets, in carloads, New York, No. 28 black, 2.45c to 2.50c; galvanized, 3.50c to 3.55c.

PHILADELPHIA.

March 15.

Conditions are slowly improving. There is a better demand for pig iron and finished material, but, with the output of blast furnaces largely increased, it is not probable that prices for pig will advance. The awarding of contracts for the Pennsylvania Railroad tunnels has had good effect, but it will be so long before the construction will be completed that the tonnage delivered in the near future will be small.

Pig Iron.—The tone of the market is stronger. Improved conditions in the Central West have been reflected in the East. If the present rate of consumption continues, the market will not be weaker, but little change in prices in expected. Large sales of Southern gray forge are reported at about $13 delivered at Schuylkill Valley mills. We quote as follows: No. 1 X foundry, $15.25 to $15.75; No. 2 X foundry, $14.50 to $15; No. 2 plain, $14 to $14.25; Southern No. 2, rail shipment, $13.75 to $14; Southern, No. 2, on dock, $13.25 to $13.50; Standard gray forge, $13.75 to $14; ordinary gray forge, $12.75 to $13; basic, $13.75 to $14.

Finished Material.—The improvement in the bar trade continues and mills are receiving very satisfactory orders. The sheet trade is more active. Structural material is still dull, but increased demand is expected soon. We quote: Bar iron, 1.43½c to 1.45c; bar steel, 1.50c to 1.55c; small angles, 1.50c to 1.55c; beams, channels and angles, 1.73½c to 1.85c.

Old Material—Scrap is still scarce and prices firm, with little change. We quote: Old steel rails, $14 to $15; miscellaneous heavy steel, $13.75 to $14.25; low phos. scrap, $18 to $19; old steel axles, $16.50 to $17; old iron axles, $19 to $20; old iron rails, $15.50 to $16.50; old car wheels, $13 to $14; choice R. R. No. 1 wrought, $17 to $18; country scrap, $16 to $17; machinery cast, $13 to $13.50; No. 2 light scrap (forge), $11 to $11.50; No. 2 light scrap (ordinary), $9 to $9.50; axle turnings, $10 to $10.50; wrought turnings, $9.25 to $9.50; cast borings, $7.25 to $7.50; stove plate, $11.50 to $12; wrought iron pipe, $12.50 to $13; boiler punchings, $15.50 to $16.50.

BIRMINGHAM, ALA.

March 15.

BIRMINGHAM, March 15.—Pig iron market conditions in the Southern territory are looking up again, the demand being quite active. The Sloss-Sheffield Steel & Iron Co. announces that its sales for the first two weeks of March aggregate 75,000 tons and the prices range from $9 to $10 per ton, with the better part of it selling at $9.25 and $9.50 per ton. Other companies in this district are selling iron liberally, $9.50 for No. 2 foundry being the usual basis. The prospects are much brighter than they were four weeks ago, the inquiry being brisk while the demand is good. One company in this district has called a halt on agents searching for business and the $10 rate has been named to see whether the market can stand it or not. The belief is strong here that the furnace companies of the Southern territory will have sold sufficient iron before the end of this month to warrant a steady production for the second quarter and longer.

Railroads are slow in responding to demands for box cars with which to move promptly the product of the furnaces and mills. The report of the Alabama Car Service Association shows that in the past month Alabama railroads handled 64,629 cars, against 54,923 for the same month in 1903.

The following quotations for iron are given in this district: No. 1 foundry, $9.50 to $10; No. 2 foundry, $9.50 to $9.75; No. 3 foundry, $9 to $9.50; No. 4 foundry, $8.75 to $9; gray forge, $8.25 to $8.75; No. 1 soft, $9.50 to $10; No. 2 soft, $9.50 to $9.75.

The Gate City mills, belonging to the Republic Iron & Steel Co., appear to be losing no time whatever. At the Bessemer mills, belonging to the Tennessee Coal, Iron & Railroad Co., there has been some faltering through labor troubles, though matters have been straightened out there now.

The steel plant at Ensley is working steadily and producing a large quantity of steel rails for which there is a good demand. Several large orders are on hand.

F. T. Schuler, president of the Alabama Steel & Wire Co., with headquarters in Gadsden, announces that before 60 days the new steel plant will be completed and in operation. It

will supply material for the rod, wire and nail mills of the same company at Ensey, which have been out of operation for nearly a year. The company is making basic iron at its new furnace at Gadsden, which has been in blast for three or four weeks now.

Cast iron pipe is in demand and shipments from the foundries in this district are heavy. Good prices prevail.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., March 15.

Pig Tin.—Such changes as have occurred during the past week have all been in the direction of lower prices. In trade circles different reports are heard concerning the consuming demand, the majority of them being to the effect that the same has quickened. Large arrivals, however, keep the premiums on spot down. In London the week has been characterized with a little spurt in the market, and prices have advanced considerably over those we previously quoted. Closing prices at the Metal Exchange today were as follows: Spot, 27.75c to $28.10c; March, 27.75c to 27.87½c; April, 27.50c to 27.75c. London's closings today follow: Spot, £125 15s futures, £125 10s. Arrivals at Atlantic ports for the month to date, amount to 2,225 tons, with 2,787 tons afloat.

Copper.—All that can be said of the market during the week is that the "official" prices remain unchanged, and the inclination to shade them in the open market is not so strong. A slight improvement has contributed to make these conditions, but it will take considerably more animation to bring about any activity that would cause rejoicing. In London the market has been stronger, and prices have advanced appreciably. Today's closings at the Metal Exchange follow: Lake, 12½c to 12¾c; electrolytic and casting, 12¾c to 12⅝c. London's closings today follow: Spot, £57 2s 6d; futures, £56 2s 6d. Exports for the month to date aggregate 8,037 tons, against 4,505 tons for a similar period last year.

Lead.—Is quiet and unchanged here at 4.60c to 4.65c for spot. St. Louis and London are slightly lower at 4.45c and £11 18s 9d, respectively.

Spelter.—Is fairly active and firm at 5.00c to 5.10c. St. Louis is unchanged at 4.80c, London is lower at £22.

Antimony.—All makes are steady. Cookson's is 7¾c to 8c; Hallet's, 7¼c to 7½c; other grades, 6¼c to 6½c.

Quicksilver.—We quote $46 per flask of 76½ pounds in lots of 100 flasks. London is £8 5s.

Nickel.—Sales are made at 40c to 47c for large lots down to a ton, and at 50c and 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, March 15.

During the spring weather of last week, there was a mild improvement in the demand for metals, principally from the roofing and galvanizing trades, but this has fallen off since the heavy snow storm of Sunday and Monday. Melters are not disposed to cover for requirements very far ahead in view of the unsettled condition of prices and trade, confining their purchases to small lots for immediate needs. Prices are without material change, and we quote: Lake, 13c to 13⅛c for carload lots, and 13¾c to 14c for lesser lots; casting, carloads, 12½c to 12¾c; less than carload lots, 12¾c to 13c. Pig lead, 4.45c in carload lots, and 4.50c to 4.55c in lesser quantities. Pig tin, carlots, 30c, and lesser quantities, 30½c. Spelter, 5c carloads, and 5¾c to 6c for lesser amounts. Sheet zinc, 5.65c per 100 pounds for 600-pound casks, with 20c advance for less than carload lots. Antimony—Cookson's, 8½ to 8¾c; Hallet's, 7¾c to 7½c. Nickel, 45c to 60c according to amount and deliveries.

Old metals are quiet and steady at the following prices: Copper wire and heavy, 11c; copper bottoms, 10c; copper clips, 10½c; red brass, 9¾c; yellow brass (heavy), 7¾c; yellow brass borings, 6c; red brass borings, 8c; light brass, 5½c; pipe lead, 4c; tea lead, 3¾c; zinc, 3¼c.

It is announced in New York that Andrew Carnegie will be selected to succeed Senator Hanna as president of the National Civic Federation, if he can be persuaded to accept.

PERSONAL.

Veryl Preston, formerly president of the American Steel Hoop Co., and afterwards a Steel Corporation vice president, has been elected president of the Eastern Steel Co., of Pottsville, Pa., to succeed Wm. F. Donovan.

Henry R. Dalton Jr., has been elected president of the Baush Machine Tool Co., Springfield, Mass., to take the place of W. H. Baush, resigned. C. J. Wetzel was elected treasurer to fill the vacancy caused by the resignation of David Hunt Jr., who recently became connected with the Warner & Swasey Co., of Cleveland.

Asa M. Mattice, chief engineer of the Westinghouse Machine Co., Pittsburg, has tendered his resignation, to take effect on April 1. He will become chief engineer of the Allis-Chalmers Co., of Chicago.

Carl Horix has resigned as general manager of the George B. Sennett Co., of Youngstown, O.

J. B. Clark has resigned from the Lackawanna Steel Co. to accept the position of superintendent of the Bessemer department and blooming mills of the Shoenberger plant of the American Steel & Wire Co., at Pittsburg.

T. Guilford Smith, agent of the Carnegie Steel Co. at Buffalo, has been named by Governor Odell for reappointment as State Regent under the recently enacted Educational Unification bill of New York State.

C. D. Warren, of Toronto, is being prominently mentioned in connection with the presidency of the Canadian Improvement Co., which is a reorganization of the Consolidated Lake Superior Co. Mr. Warren is a successful merchant and manufacturer. He is president of the Imperial Lumber Co. and of the Metropolitan Electric Railway Co., of Toronto, and also of the Traders' Bank of that city.

Charles E. Krebs has been appointed superintendent of the Jewett Car Works, Newark, O., to succeed Neil Paulson, who recently accepted a similar position with the Cincinnati Car Co.

Harry Fisher has resigned his position as general foreman of the Lorain Foundry Co., of Lorain, O., to accept a like position with the Buffalo Foundry Co., of Buffalo, N. Y., the change being effective April 1st.

George B. Cortelyou, secretary of the Department of Commerce and Labor, Washington, D. C., paid a visit to the South Works of the Illinois Steel Co., South Chicago, Monday, the 14th, and also inspected the plant of the McCormick Division of the International Harvester Co., for the purpose of studying the conditions under which the employes in the various departments worked.

Obituary.

James P. Witherow, who, until 1890, was one of the best known builders of blast furnaces and iron and steel works, died at his home, Pittsburg, on Sunday evening, March 13, aged 75 years. Early in the 80's Mr. Witherow and his partner, Mr. Gordon, organized the firm of Witherow & Gordon and erected a large plant at New Castle, Pa., for the manufacture of iron and steel works machinery and to do furnace work. The firm became involved in financial difficulties in 1889 and the plant was sold and is now known as the Pennsylvania Engineering Works. Many of the old furnaces in the country today were built by this concern. The firm at one time was immensely wealthy. Mr. Gordon is now located in Philadelphia, acting in the capacity of consulting engineer, while during the past ten years Mr. Witherow has been retired.

S. S. Vail, who in 1849 founded the foundry company known as the Vail-Armitage Co., Keokuk, Ia., and conducted the business until 1876, died in Loomis, Cal., March 3.

George Henry Firth, superintendent of the Firth-Sterling Steel Co., of Demmler, Pa., a branch plant of Thomas Firth & Sons Steel Co., of Sheffield, Eng., died March 15, at his home in Pittsburg, of pneumonia, aged 47 years. His father, Thomas Firth, was the founder of the famous steel plant at Sheffield, and the Demmler works, in addition to manufacturing crucible steel for the merchant trade, has been a large producer of projectiles. Deceased was with the Sheffield plant for 25 years, and upon the completion of the Demmler works came to this country and assumed charge.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE IRON & STEEL PRESS CO.

ROSE BUILDING, CLEVELAND, OHIO.

G. H. GARDNER, President and Treasurer,
JOHN A. PENTON, Vice-President,
A. I. FINDLEY, Secretary

A. I. FINDLEY, - - - - - - - - EDITOR.
ROBERT I. CLEGG, - - EDITOR MACHINERY DEPARTMENT.
GEORGE SMART, - - - - - ASSOCIATE EDITOR.

CHICAGO: 1115 Monadnock Block, GEO. H. GRIFFITHS, Manager.
PITTSBURG: 429 Park Building, A. O. BACKERT, Manager.
NEW YORK: 150 Nassau St., D. C. WARREN, Manager.
THE CENTRAL WEST: R. A. EVANS, Manager.

Subscription, $3.00 per annum. To Foreign Countries, $4.00.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

MARCH 17, 1904.

BEHAVIOR OF CAST IRON UNDER HEAT.

The recent papers of Mr. Alex E. Outerbridge Jr., of Philadelphia—the first before the Franklin Institute and later ones of the same import before foundrymen's and engineering organizations—were reinforced quite strongly as to their main proposition by the Baltimore fire. While the expansion of cast iron under heat has been long known in a general way, and this previous knowledge has been brought out somewhat prominently in the discussions on Mr. Outerbridge's papers, it does not appear that such knowledge has been acted upon in the way that might have been expected had it been practical or complete. Mr. Outerbridge has pointed out that the ability to make cast iron "grow" under repeated heatings, with alternate coolings, can be turned to account in a number of useful ways. The Baltimore fire on the other hand has given proof that will be assigned to the opposing category since it points out where cast iron should not be used.

The special case in point is the condition of the Continental Trust Co.'s 16-story steel building at Baltimore after the fire. While the entire inflammable contents of the building were roasted and consumed, the steel framework appears plumb and intact. The significant thing noticed is that the cast iron framework of the doors, which was set in granite, was expanded and bent to a very considerable extent. And after the fire there was no contraction in size from the expanded state.

While the Baltimore fire shows no different effect upon cast iron than has doubtless been noticed in other fires, its testimony on this point will have more heed in view of the practical value Mr. Outerbridge's experiments have given it. The latter have shown how the expansive property of cast iron can be turned to use; the great fire has pointed out that steel and not cast iron is the material to be used where resistance to the effects of fire is called for. The chief service Mr. Outerbridge has rendered engineers and all users and manufacturers of cast iron and steel, is in translating what has been known for years concerning their different behavior under high temperatures into distinctly usable data governing the choice of materials.

RAILROADS AND THE IRON SITUATION.

In the placing of the contract for the tunnel under the East and North rivers to be constructed by the Pennsylvania and Long Island railroad companies, may be found a partial explanation for the increased activity in foundry pig iron within the last few days. It will be remembered that the specifications for the tunnel call for the employment of something over 300,000 tons of iron castings, the deliveries extending over three years. This means the purchase of about 100,000 tons of pig iron for delivery during this year and the exercise of options given by furnaces and other pig iron interests to foundries some time since. It is estimated that about $35,000,000 will be spent on the entire construction of the tunnel. In addition to the iron castings a considerable tonnage of steel plates, structural shapes and steel castings will be required.

One of the most interesting features of the present situation is the extent to which the present improvement in the steel and iron industry is based upon prosperity in agricultural districts, and it is significant that many steel mills can be so well employed on orders coming from hardware jobbers and country merchants, who distribute wire products throughout the West and South. The railroads have not been as generous with contracts for steel as was anticipated a few weeks since, but indirectly they are contributing more to maintain the present activity than is apparent on the surface. With the single exception of rails, the meager orders from railroads have been more due to an unkind money market, or at least to an apathetic security market, than to the lack of a disposition to place contracts for needed equipment. However, orders are coming out indirectly which in the aggregate give quite a little tonnage through the medium of car works and manufacturers of machine tools. Since the opening of the current month both manufacturers of machine tools and dealers have been awarded some substantial contracts by railroads in various sections of the country. Among the more important roads in the market are the Canadian Pacific, the Southern Pacific, Delaware & Hudson, Delaware, Lackawanna & Western, New York Central and the Southern Railway, which have been providing equipment for their construction and repair shops.

There is reason to believe that other railroads will take similar action in the near future, basing the opinion upon the fact that the equipment is needed and the means to purchase are more likely to be provided through the increase in railroad earnings foreshadowed by recent reports. January of this year proved to be extremely unfavorable for transportation interests—discouraging new projects—there being a decrease in gross earnings of over $1,827,417—the worst monthly exhibit since the early part of 1899. February, however, notwithstanding the severe storms in certain sections, was more favorable than was anticipated; according to the returns made to the *Financial Chronicle* there was a loss of only $142,737 or about 1-3 of one percent in gross earnings of railroads during that month.

The volume of general business has been somewhat smaller than during the corresponding month last year, although the falling off has been of a less degree than in the iron and steel trade. The increased earnings of the roads in the South and Southwest have served to offset the losses recorded by lines in other parts of the country. The total gross earnings of the 67 roads reporting were $45,889,825, against $46,032,562 during February last year. The Canadian roads and those in the Northern part of the United States have been especially affected adversely by the extreme cold weather, and the blockade in Northern New York is reported to have been the worst in over 30 years, not a wheel turning on some of the branches of the New York Central, at times. The grain movement is reported to have been very irregular, but in the aggregate does not differ materially from that of the year previous. The cotton movement in the South fell far below that of 1903, but on the other hand the live stock movement in the West was very much heavier than during the preceding year; the Western and Southwestern roads deriving greatly increased traffic from this source. The showing for February this year is more favorable than indicated superficially, as the comparison is made with a month in 1903 which had recorded material gains in railroad gross revenues.

While it is gratifying to note a larger volume of business for steel bars, sheets, and tin plates, it is a question how far trade should be stimulated by advancing prices when the legitimate business in sight does not warrant the placing of orders for material except in anticipation of future requirements. However, the bulk of recent business has been at relatively low prices; and if orders for agricultural implements and cars can be secured in sufficient volume the danger that lurks in this method of stimulating business may be avoided.

LOW TON-MILE COST ON THE "BESSEMER" ROAD.

While the operating expenses of railroads all over the country showed an increase in 1903, the Pittsburg, Bessemer & Lake Erie road still kept well within the limits of the ton-mile cost set by its projector. The ton-mile cost in 1903 was 2.36 mills, against 2.22 mills in 1902 and 1.87 mills in 1901. The increase of .14 mill from 1902 to 1903 is more than explained by the increased cost of supplies. Thus, the average cost of coal in 1902 was $1.07 per ton and in 1903 it was $1.35. Wood increased from $1.25 to $1.35 per cord. The great difference between 1901 and the two following years in ton-mile cost is due in considerable part to a change in the system of accounting, by which all expenditures after 1901 are charged to maintenance. In that year a construction account was carried.

The "Bessemer" road has operated under a disadvantage, which was reduced in 1903. It started with comparatively little return haul to balance the ore, which constitutes the great bulk of the south bound tonnage. In 1903 the north bound tonnage was 2,046,071 tons, an increase of 458,138 tons, the coal tonnage being 1,427,635 and contributing 423,320 tons of the increase. The ore moved has been as follows:

1901	3,662,417 tons.
1902	4,685,045 tons.
1903	4,379,179 tons.

This ore goes to the Duquesne, Edgar Thomson and Carrie furnaces of the Carnegie Steel Co. It was expected that between 4,500,000 and 5,000,000 tons would be moved in 1903, but the sudden curtailment of blast furnace operations prevented the realization of this expectation. This ore is carried on a 20-year contract, at 3½ mills per ton per mile. With the north bound freight tonnage 24 percent of the south bound in 1901, 21 percent in 1902 and 30 percent in 1903, or 25 percent on an average, it is certainly doing the work cheaply to haul a ton of freight a mile for 2.15 mills as an average of the total tonnage either way in the three years.

Pipe Mill Improvements.

(Special Telegram.)

PITTSBURG, March 16.—Spang, Chalfant & Co., Inc., operating the Etna Iron and Tube Works, Pittsburg, will make extensive improvements and additions in the near future. The company last year completed the installation of a fifth lap weld furnace capable of making pipe up to 30 inches in diameter. Much of the old machinery in the plant is to be replaced by modern equipment and the capacity greatly increased.

The *Marine Review*, of Cleveland, in its current issue, makes a high record in marine journalism, both in the elaborateness of contents and the attractiveness of type dress and illustrations. Of the latter there are 90 striking half-tones, in addition to reproductions of many detail drawings of battleship engines, a new revenue cutter, and other equipment. With this issue the *Marine Review* changes to the 9 x 12-inch size and adopts a new design for its front cover, preparatory to the occupancy of that page by a single advertisement each issue. The contents of the number, known as the fitting-out issue, represent a noteworthy list of contributors, including Secretary Cortelyou, Senator Frye, Hon. T. E. Burton, chairman of the committee on rivers and harbors of the House of Representatives; Col. Thos. W. Symons, of the Erie Canal Advisory Commission, and Winthrop L. Martin, who wrote the "History of the American Merchant Marine," and President W. L. Brown, of the American Shipbuilding Co. The Panama Canal receives much attention, and the whole number sounds vigorously the note of protection to American shipbuilding and ship-ownership, with a view to the large development of an American carrying trade.

In eighteen words, Hermon B. Butler, the late vice president and treasurer of Joseph T. Ryerson & Son, Chicago, disposed of his large estate by will. The estate is in personal property, and the value is placed at $610,000. The will reads: "This is my last will. I give all my property to my wife, whom I appoint sole executrix."

The American Malleable Iron Co., which was incorporated in 1902, has been declared bankrupt. The company's plant is located at Chicago Highlands, near Barrington, Ill. Ryerson P. Gates and Henry L. Wilson were appointed receivers of the company several weeks ago. It is expected that the plant of the company, whose value is estimated at $150,000, will be sold.

The production of 764 tons of rails at the Ensley, Ala., mill of the Tennessee Coal, Iron & Railroad Co. on a recent day is referred to as a new record there, the average having been between 500 and 600 tons.

The Ella blast furnace at West Middlesex, Pa., owned by Pickands, Mather & Co., of Cleveland, resumed operations March 13, after a six months' idleness.

The plant of the Maritime Nail Works, St. John, N. B., was burned March 11. Loss, $50,000.

The Labor Situation.

MORE SHEET AND TIN PLATE WAGE REDUCTIONS.

(Special Telegram.)

PITTSBURG, March 16.—It now develops that the American Sheet & Tin Plate Co. has issued an ultimatum to the Amalgamated Association citing violations of clause 4 of the memorandum of agreement and unless granted the same privileges as the independent sheet and tin plate mills, will consider the association has violated the provisions of the scale and will call off all further relations. It is a question with the Amalgamated Association of losing all the union mills of the American Sheet & Tin Plate Co., or the independent mills, which will certainly demand further concessions from their men, when the American Sheet & Tin Plate Co. is granted the same privileges they are enjoying. The Amalgamated Association choses to live up to its scale with the American Sheet & Tin Plate Co., and therefore the executive board which will meet tomorrow is expected to grant the same concessions as the independent sheet and tin plate manufacturers are enjoying. On the sheet scale it will amount to an additional reduction of 10 percent, while the tin plate workers will be compelled to take a reduction averaging from 15 to 20 percent. It was learned this morning that the American Sheet & Tin Plate Co. proved to the advisory board of the association violations of the scale, at independent mills located at Washington, Canonsburg and Avonmore, Pa., and Niles, Youngstown, and Steubenville, O.

Nearly all the votes of the sheet and tin plate lodges on the call for a special convention are in and a majority of the lodges have voted against the proposition. Knowing that the special convention would not be sustained a hurried call was sent out for a meeting of the executive board which will be called upon to act in lieu of the convention. Should reductions be granted the American Sheet & Tin Plate Co., some of its idle union mills will be placed in operation, but probably only those in which the cost of operating is less than in the non-union mills now running, some of which will probably be shut down.

The report that the Amalgamated Association has received a proposition from the officials of the American Sheet & Tin Plate Co. that on the acceptance of a 20 percent reduction they would immediately place in operation all of their idle union sheet and tin plate mills has been officially denied. Fires were lighted on Tuesday at the Ætna-Standard sheet mill and on Wednesday some of the men returned to work at a reduction of about 10 percent. Officials of the American Sheet & Tin Plate Co. allege that the men made the proposition offering a reduction if the plant be placed in operation and a large number of the men have agreed to work under these conditions. The Ætna-Standard plant has not been operated for more than a year, and a large number of union sheet mills operated by the American Sheet & Tin Plate Co. have been idle for a still longer period. So far as can be learned, however, the men at the other plants have not yet made propositions to the company to accept further wage reductions providing the plants be placed in operation. The Ætna-Standard plant is one of the largest sheet mills owned by the American Sheet & Tin Plate Co. and contains 23 mills.

Mixed Conditions in Sheet and Tin Plate Mills.

The sheet and tin plate lodges of the Amalgamated Association of Iron, Steel and Tin Plate Workers voted this week on the proposition of holding a special convention of their trades for the purpose of adjusting many alleged evasions of the present scale. The circulars were sent out as a result of the conferences held between the advisory board of the Amalgamated Association and the officials of the American Sheet & Tin Plate Co., held at Pittsburg last week. The officials of this company claimed that some of the independent sheet and tin plate manufacturers were evading the scale, which was unfair to them, inasmuch as they are paying the full Amalgamated wages in all their mills. The aceptance of a reduction by the sheet workers employed in the Ætna-Standard plant of the American Sheet & Tin Plate Co., at Bridgeport, O., is held in abeyance until the vote of the lodges on holding a special convention is definitely known.

At Canonsburg, Pa., the plant of the Canonsburg Iron & Steel Co. is idle owing to the refusal of the men to accept the reduction, or rather profit-sharing plan, proposed by the company. At Avonmore, Pa., the employes of the Alcania tin plate plant are still working, but they have been notified that on Saturday next they must come to the headquarters of the Amalgamated Association, Pittsburg, and explain the plan under which they are working. They were to have appeared last Saturday but the meeting was postponed. At Steubenville, O., the Pope Tin Plate Co. asked its employes to accept a profit-sharing plan but this they refused. The plant is still operating in full, however.

In the tin plate trade the Amalgamated Association is no longer collecting the 3 percent reduction allowed on rebate plate for the American Sheet & Tin Plate Co. The fund is very large at the present time, an indication that the orders for rebate tin plate were not as heavy during the past year as was expected when the reduction was allowed for the purpose of capturing this trade. Until this fund is materially reduced the collection of the 3 percent from the wages of the men in the tin mills of the American Sheet & Tin Plate Co. will be discontinued.

On the other hand the American Sheet & Tin Plate Co. has good-sized accumulations of stocks, which are calculated to bring concessions in the present tin plate scale at the coming convention. While the spring demand is reported excellent the stocks are heavy and with the mills running as at present until July 1 almost enough tin plate will be made to supply the entire demands of 1904, with all the union tin mills idle the remainder of the year. At the present time the American Sheet & Tin Plate Co. is operating 219 mills, with an output of about 10,000,000 boxes a year as compared with a normal consumption of about 7,000,000 boxes. A complete list of the active and idle tin plate plants of the American Sheet & Tin Plate Co. is given below:

UNION MILLS OPERATING.

Name and Location.	No. of Mills.
American, Elwood, Ind.	28
Anderson, Anderson, Ind.	7
Greer, New Castle, Pa.	20
Shenango, New Castle, Pa.	30
Sharon, Sharon, Pa.	20
LaBelle, Wheeling, W. Va.	10
Laughlin, Martins Ferry, O.	24
Morewood, Gas City, Ind.	8
Total	147

NON-UNION MILLS OPERATING.

Monongahela, Pittsburg	16
Star, Pittsburg	8
Demmler Works, McKeesport, Pa.	11
National, Monessen, Pa.	24
Crescent, Cleveland, O.	6
Chester, Chester, W. Va.	7
Total	72

UNION MILLS IDLE.

Cambridge, Cambridge, O.	6
Champion, Muskegon, Mich.	6
Falcon, Niles, O.	6
Humbert, Connellsville, Pa.	6
Middletown, Irondale, O.	4
Pennsylvania, New Kensington, Pa.	6
Pittsburg, New Kensington, Pa.	7
Total	41

NON-UNION MILLS IDLE.

Beaver, Lisbon, O.	7

Out of a total of 267 tin plate mills operated by the American Sheet & Tin Plate Co., estimating the Monongahela plant at 16 mills, which only contains eight, but has the Bray system installed, which practically doubles the output, 188 are union mills. Of these 41 are idle, while of the 79 non-union mills, only 7 are idle. The only idle non-union mill is at Lisbon, O., and it is doubtful if this plant will ever be operated again. Independent manufacturers operate 88 tin mills, with 10 under construction. They are as follows, the union mills being marked with an asterisk:

NAME AND LOCATION.	NO. OF MILLS.
*Alcania Co., Avonmore, Pa.	3
*Carnahan Sheet & Tin Plate Co., Canton, O.	6
*Griffith Interests, Waynesburg, Pa.	9
*Griffith Interests, Washington, Pa.	2

Jackson Iron & Tin Plate Co., Clarksburg, W.Va.	8
Lalance & Grosjean, Harrisburg, Pa.	4
*National Enameling & Stamping Co., St. Louis, Mo.	6
*Pope Tin Plate Co., Steubenville, O.	12
*N. & G. Taylor Co., Cumberland, Md.	8
*McClure Co., Washington, Pa.	6
*Whitaker-Glessner Co., Wheeling, W. Va.	4
McKeesport Tin Plate Co., Port Vue, Pa.	10
Juniata Steel & Iron Co., Greencastle, Ind.	6
Standard Tin Plate Co., Canonsburg, Pa.	4
Total	88

The Rolling Mill Co. of America has a 10-mill plant under construction at Morgantown, W. Va., but it is doubtful if it will be completed, as the company recently went into the hands of a receiver. The plant of the Juniata Iron & Steel Co. has been idle for many months, while the new plant of the Standard Tin Plate Co., Canonsburg, Pa., has never been placed in operation.

NATIONAL METAL TRADES ASSOCIATION.

The indications are that the national convention of the N. M. T. A., which meets in Philadelphia, with headquarters at Hotel Walton, March 23 and 24, will be one of the most important and most successful in the association's history. The annual reports of the officers will present matter of unusual interest. One feature of the secretary's report will be a comparative statement of wages and hours prevailing at different machinery manufacturing centers. There will be no formal banquet in connection with the convention, the social occasion being the smoker on Wednesday night given by the Philadelphia members to the visitors.

The most important of the subjects up for discussion at the convention are the following: "National Agreements," "Annual Dues," "Method of Assessments," "Labor Bureaus," "Scientific Shop Management," "Proper Relationship between the Local and the National Associations."

The semi-annual issue of the buyers' guide of the association is in the hands of the printer and will be issued this week.

The Walsh & Widener Boiler Co., of Chattanooga, Tenn., reports that with the assistance of the association it has overcome a recent labor difficulty and its works are now running full time and without any trouble.

Three of the most prominent concerns in the machinery business in Memphis, Tenn., have applied for membership in the association. The efforts of the association officials have resulted in the organization of a Citizens' Alliance in Memphis.

The following paragraph, which appears on page 239 of the *Machinists' Journal*, has created considerable comment among N. M. T. A. officials: "President O'Connell, accompanied by Messrs. Ford and Tucker, of the G. E. B., held a preliminary conference with three of the conservative members of the National Metal Trades Association in New York last month which may lead to another agreement between the two organizations." Another comment on the same lines appeared in the Washington *Star* last week, which would tend to show that officers of the I. A. of M. will use every effort to bring about some conciliatory arrangement.

LABOR NOTES.

The strike of boilermakers of the Southern Pacific railroad in California has been settled. The men were granted an advance in wages.

The structural iron workers of Newark, N. J., have declared off the strike at the new court house of that county. They also dismissed their business agent, claiming that he acted prematurely in calling the strike.

Fifty-two boilermakers and laborers in the Boston & Albany railroad shops, in Springfield, Mass., struck a few days ago becaus the company refused to re-instate two workmen who were discharged for absenting themselves from work without notice.

In the application for a writ of injunction made in Chicago by the Beardslee Chandelier Mfg. Co. the striking employes were enjoined from performing illegal acts, but Judge Brentano declined to make the injunction apply to the American Federation of Labor.

Machinery manufacturers of Milwaukee will make an effort this year to re-establish the piece work system in their shops. They believe that by paying each man the same amount in wages, whether he produces much or little, the manufacturer is encouraging poor work.

The Niagara Ship Canal Bill.

The bill now before Congress for the construction of the Niagara Ship Canal around the rapids of the Upper Niagara river at Buffalo is being supported by all the lake carrying interests as essential to the requirements of inter-State commerce and its passage will be urged. At the hearing before the rivers and harbors committee in Washington, March 25, the commerce of the Great Lakes will be represented by one of the strongest delegations ever sent to Washington to advocate the passage of such a measure, as it is considered that this is a project of national importance and interest, in connection with the 1,000-ton barge canal soon to be built by the Empire State at a cost of $101,000,000, of which it is a necessary complement.

The proposed ship canal is to be constructed from the Erie basin in Buffalo harbor to the foot of Squaw Island, alongside of the Erie canal for a distance of two miles, with necessary locks and basins and the estimated cost, with the retaining works which will be required at the entrance to the Niagara river, is $4,500,000, which is the amount the Federal Government is asked to appropriate by the bill now pending.

The ship canal will throw open to the deep draft vessels of the lakes many miles of water frontage between Buffalo, Tonawanda and Niagara Falls, will afford direct connection from Lake Erie to the enlarged Erie canal and provide adequate terminal and transfer facilities for the transfer of cargoes of grain, iron ore, copper ore, lumber and other commodities from lake vessels to the 1,000-ton canal barges.

Among those who are expected to speak before the rivers and harbors committee and present arguments in favor of the ship canal are: William Livingstone, president, and Harvey D. Goulder, general counsel of the Lake Carriers' Association; James J. Hill, president of the Great Northern railroad; W. C. Edgar, editor of the *Northwestern Miller;* Col. Livermore, of Boston, head of the Calumet & Hecla Mining Co.; John G. Milburn, of New York City, and prominent men of the chambers of commerce of Duluth, Minneapolis, Buffalo and other cities.

Charles Hyde, of Hyde Bros. & Co., Pittsburg, left for England on Wednesday, March 16, in connection with a large boiler contract which the firm recently secured there in competition with English and other American boilers. They installed 2,500 h. p. of the Hyde patent water-tube boiler in connection with the blast furnaces of the Central Iron & Coal Co., of Tuscaloosa, Ala., about a year ago and that company reports that it is entirely satisfied with the operation of the boilers.

The Deseronto Iron Co., of Deseronto, Ont., has filed a petition for the winding up of the business of the St. Thomas Car Wheel Works of St. Thomas, Ont. The company, which has been in active operation for twelve or fifteen years, was organized by P. H. Griffin, of Buffalo, who is president of the company and supposed to be one of the largest stockholders. Mr. Griffin was formerly president of the New York Car Wheel Works, Buffalo, now in the hands of a trustee in bankruptcy. A hearing on the petition will be held in Toronto this week.

The California Mfg. Co., San Francisco, Cal., has removed its plant to its new building, Brannan and Ninth streets, which gives it increased facilities for the production of special foundry work and sash weights.

The plant of the Detrick & Harvey Machine Co., of Baltimore, was not damaged in the great fire and the company's facilities for handling business in planers, drilling and boring machines and special machines are unimpaired.

The following have been elected directors of the Buffalo Union Furnace Co.: Daniel R. Hanna, R. L. Ireland, Frank B. Richards, C. A. Collins, Frank B. Baird, Henry J. Pierce and Harry Yates.

UNITED STATES STEEL CORPORATION IN 1903.

The annual report of the United States Steel Corporation has been issued, covering the year ending Dec. 31, 1903. The gross sales and earnings (including sales between companies) amounted to $536,572,871 for the year, as against $560,510,479 in 1902. The net earnings were $109,171,152, as against $133,308,764 in 1902. The output of iron ore and various products in the two 12-month periods is as follows in gross tons:

	1903.	1902.
Iron Ore	15,363,355	16,063,179
Pig Iron	7,123,053	7,802,812
Steel Ingots	9,167,960	9,743,918
Steel Rails	1,934,315	1,920,786
All Finished Products	7,635,690	8,197,232
Wire Products	1,126,605	1,122,809

The expenditures made by all properties during the year for maintenance, renewals and extraordinary replacements, were $34,785,191. This entire amount was charged to current operations. The expenditures for extraordinary replacements in 1903 exceeded those for 1902 by $5,012,985.

Detailed Financial Statement.

	1903.	1902.	Changes.
Gross sales and earnings	$536,572,871	$560,510,479	De$23,937,608
Manufacturing and producing cost and operating expenses	409,268,599	411,408,818	Dec. 2,140,219
Balance	$127,304,272	$149,101,661	De$21,797,389
Miscellaneous income	1,720,043	3,128,970	Dec. 1,408,927
Total manufacturing income	$129,024,315	$152,230,631	De$23,206,316
Other income	3,548,550	5,426,452	Dec. 1,877,908
Total income	$132,572,865	$157,657,083	De$25,084,218
General expenses	16,847,852	17,501,892	Dec. 654,040
Balance of income	$115,725,013	$140,155,191	De$24,430,178
Interest charges	6,553,861	6,846,427	Dec. 292,566
Net earnings	$109,171,152	$133,308,764	Dec$24,137,612
Depreciation and sinking fund	25,495,366	24,774,389	Inc. 720,977
Balance	$ 83,675,786	$108,534,375	De$24,858,589
Bond interest and sinking fund	22,880,296	18,227,850	Inc. 4,652,446
Balance	$ 60,795,490	$ 90,306,525	De$29,511,035
Preferred dividend	30,404,173	35,720,178	Dec. 5,316,005
Balance	$ 30,391,317	$ 54,586,347	De$24,195,030
Common dividend	12,707,562	20,332,690	Dec. 7,625,128
Surplus	$ 17,683,755	$ 34,253,657	De$16,569,902
Charged off	5,378,838	.....	Inc. 5,378,838
Surplus	$ 12,304,917	$ 34,253,657	De$21,948,740

BALANCE SHEET.

The general balance sheet as of Dec. 31, 1903, compares as follows:

Assets.	1903.	1902.
Property account	$1,357,394,469	$1,325,267,583
Deferred charges to operation	4,820,343	3,178,759
Trustees of sinking fund	497,051	459,246
Investments	3,522,546	2,804,488
Inventories	107,976,523	104,390,844
Accounts receivable	34,457,369	48,944,189
Bills receivable	3,139,457	4,153,291
Agents' balance	1,029,470	1,091,318
Sundry marketable stocks and bonds	5,985,509	6,091,340
Cash	50,199,661	50,163,172
Due from bankers	12,822,900	.....
Total	$1,583,845,299	$1,546,554,234
Liabilities.		
Common stock	$ 508,302,500	$ 508,302,500
Preferred stock	360,281,100	510,281,100
Capital stock sub-companies not held by U. S. Steel Corporation	109,114	215,941
Bonded and debenture debt	551,041,035	360,754,326
U. S. Steel Corporation 5% bonds issued and sold	17,097,500	.....
Mortgages and purchase money obligations of sub-companies	5,882,864	9,590,550
Current accounts payable and payrolls	15,729,798	18,675,080
Bills and loans payable	4,429,484	6,202,502
Specie deposit due employes and others	3,941,794	4,485,546
Reserve for expenses	783,560	.....
Accrued taxes	1,408,697	1,951,605
Accrued interest and unpresented coupons	6,942,393	5,398,572
Preferred stock dividends payable Feb.	6,304,919	8,929,919
Common stock dividends payable March	.....	5,083,025
Sinking and reserve funds	26,815,812	25,217,747
Bond sinking fund with accretions	8,678,051	4,481,246
Undivided surplus U. S. Steel Corporation and sub-companies	66,096,682	77,874,597
Total	$1,583,845,299	$1,546,544,234

NET EARNINGS BY MONTHS.

Monthly net earnings from April 1, 1901, to Dec. 31, 1903, follow:

	1901.	1902.	1903.
January	.....	$ 8,901,016	$ 7,425,775
February	.....	7,678,583	7,730,361
March	.....	10,135,858	9,912,571
April	$ 7,356,744	12,320,766	10,905,204
May	9,612,349	13,120,930	12,744,324
June	9,394,748	12,220,362	12,992,780
July	9,580,151	12,041,913	12,384,647
August	9,810,881	12,972,729	10,918,174
September	9,272,811	11,930,846	9,120,134
October	12,305,774	13,652,707	7,675,141
November	9,795,840	10,686,906	4,069,901
December	7,758,298	8,646,146	3,292,139
Total	$84,787,596	$133,308,764	$109,171,152

Inventory, Wages, Stock, etc.

The expenditures by all companies during the year for construction and additions, were $31,042,135, of which $8,421,189 was for the Union Steel Co. During the year the outlays for construction included $13,617,466 for manufacturing properties; $2,780,520 for coal and coke properties; $4,431,884 for transportation properties.

The increase of valuation in total inventories of 1903 over those of 1902, is more than accounted for in the item of ore alone, which shows an increase over last year of $7,946,049, or 23 percent in inventory valuation, and an increase of 31 percent in quantity on hand. On Dec. 31 the Steel Corporation had on hand ore valued at $42,018,988; pig iron, $5,885,039; finished products, $21,564,586; stocks abroad and on consignment, $1,368,697; material in transit, $2,584,530.

The number of employes in the service of all companies during the year was 167,709, as against 168,127. The Steel Corporation paid out in wages last year $120,763,896, as compared with $120,528,343 in 1902. The offer to the employes of the corporation and of the subsidiary companies to subscribe for the preferred stock was accepted by 10,248 employes for 32,510 shares.

The number of preferred stockholders in February, 1904, was 42,720, compared with 31,799 in February, 1903, while the number of holders of common stock in December last was 37,237, compared with 26,830 in December, 1902.

The total inventory of all properties on Dec. 31, 1903, was $107,976,523, against $104,390,844 on Dec. 31, 1902, an increase of $3,585,679. Current assets are $215,610,889, of which $50,199,660 is cash on hand. Accounts receivable are $34,457,369; current liabilities are $39,540,639. Current accounts payable, $15,729,791. The undivided surplus of the Steel Corporation and subsidiary companies is $90,130,810, less expense of conversion and construction, and capital liabilities $24,034,128, leaving present undivided surplus $66,096,682.

Up to March 1 of the present year the Steel Corporation had received from J. P. Morgan & Co. for the bond syndicate, $11,000,000 in cash, and had delivered $8,000,000 in bonds, leaving $9,000,000 cash to be received and $12,000,000 bonds to be delivered. In all the bonds issued up to date under the conversion plan amount to $158,000,000.

The corporation has the right at its option at any time to call for the remaining $9,000,000 in cash, but in order to avoid the unnecessary burden of interest upon bonds issued for money not immediately needed, arrangements have been made with J. P. Morgan & Co. whereby, until otherwise provided, the corporation will not be required to call the remaining $9,000,000 cash or to deliver bonds therefor, except when and as the cash shall be needed by the corporation. J. P. Morgan & Co., representing the syndicate, have received, or will receive, as compensation, 4 percent upon the par of $170,000,000 bonds, for which there have been sold to and received by the corporation 1,500,000 shares of preferred stock at par, besides the $20,000,000 in cash received. The total capital stock of the steel corporation outstanding Dec. 31 was:

Common stock	$508,302,500
Preferred stock	360,281,100

On Dec. 31, 1903, the tonnage of unfilled orders on the books was 3,215,123 tons of all kinds of manufactured goods, as compared with a tonnage of 5,347,253 at the corresponding date in 1902.

Commencing with Jan. 1 last, the corporation inaugurated the plan of segregating the profits of subsidiary companies until such profits have been actually realized by the conversion of the material and the actual sale to customers outside the corporation.

This plan has been adopted as conservative and safe. Under it earnings reported for all companies will represent cash earnings to the organization, and will not be subject to reduction for adjustment in valuation of materials and products.

In his recommendation, Chairman E. H. Gary, of the board of directors, says: "Occasionally publications are made concerning the affairs or earnings or results of the business of

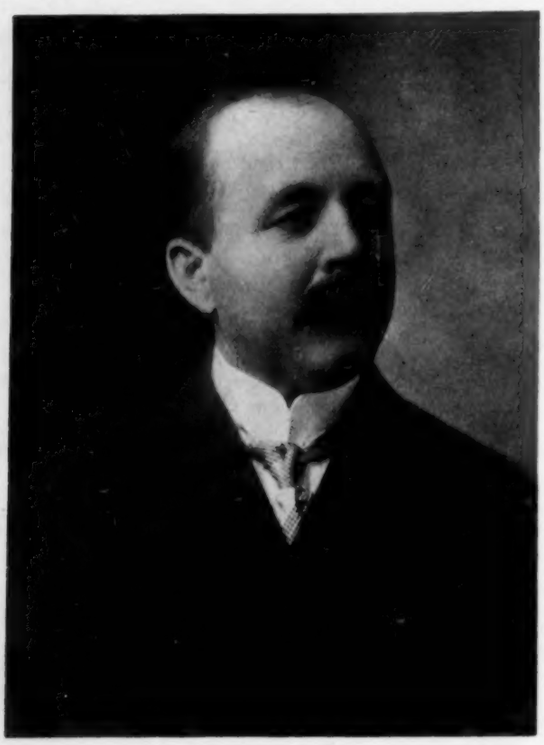
the corporation, which are stated to be based on information derived from an 'official' or 'director' or 'one identified with the corporation,' or 'from inside sources.' Obviously it would be inexpedient to undertake to contradict or explain statements of this kind, even though inaccurate and unreliable. From time to time information relating to the affairs of the corporation is given out by the officials for publication, but it is the rule in such cases to accompany the statement with the name or office of the official making the statement, and no publication should be considered authoritative unless so identified."

OFFICIAL CHANGES IN THE ALLIS-CHALMERS CO.

At a meeting of the board of directors of the Allis-Chalmers Co., held in New York City, Wednesday, March 9, the resignations of Charles Allis, president; H. W. Hoyt, second vice president and Philetus W. Gates, general superintendent, were tendered and accepted. B. H. Warren, of Pittsburg, formerly second vice president of the Westinghouse Electric & Mfg. Co., was elected to succeed Mr. Allis as president, and will enter upon his duties April 1. No successors have yet been appointed to Mr. Hoyt and Mr. Gates, and they will continue in their present capacities until relieved. Both were strongly urged to reconsider their decision to retire and the final action of the board of directors was taken with much reluctance. Mr. Hoyt resigned also as a director of the company, his place on the board being filled by Mr. Warren. Mr. Gates is still a director and will remain so.

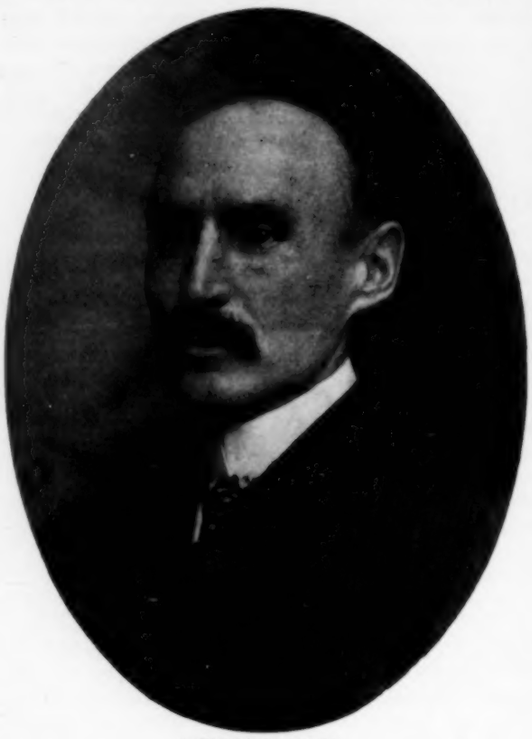
B. H. Warren is a naval academy man of the class of '74. He left the navy in 1876 and was with the Hancock Inspirator Co., Boston, Mass., until 1890 as mechanical engineer, London manager and superintendent. For the next five years he was with the Yale & Towne Mfg. Co., and the Pratt & Whitney Co. He became assistant general manager of the Westinghouse Electric & Mfg. Co. in 1896, and for five years was second vice president in charge of the manufacturing and commercial branches of the business.

As soon as they are relieved of their duties, Mr. Gates and Mr. Hoyt will take an extended trip abroad, and upon their



HENRY W. HOYT.

return will engage in the manufacturing business together. The foreign trip is one that has long been considered, both gentlemen feeling the need of a rest and a change. Mr. Hoyt and Mr. Gates have been associated in business for the past 20 years, taking hold of the Gates Iron Works, of Chicago, when it was a very small institution and building up its business until the company occupied an absolutely model plant, employing about 600 men. The Gates rock and ore crushers have long been favorably known all over the world. Apart from the success they have won as manufacturers and managers, Messrs. Hoyt and Gates have rendered important service in connection with the work of associated employers in metal trades and foundry lines. Both are ex-presidents of



PHILETUS W. GATES.

the National Founders' Association and to that organization's policy and prestige they contributed some of the best thought that has been brought to bear upon its problems. Being at the age at which experience and ambition unite to make men of affairs most valuable to enterprises of moment, the development of their plans for the later future, when the projected tour of the world shall have been completed, will naturally be of much interest to their friends.

Kuhlman Car Co. Absorbed.

The Kuhlman Car Co., of Cleveland, was purchased on March 16 by the J. G. Brill Co., Philadelphia. Samuel M. Curwen, of Philadelphia, was elected president of the reorganized company succeeding Fayette Brown, of Cleveland, and Charles A. Ricks continues as secretary. The Cleveland directors are: R. A. Harman, G. E. Cowen, P. M. Hitchcock and D. B. Dean. The new managment brings sufficient orders to insure activity in the operation of the company for some time to come. The Brill concern now has three plants, the Philadelphia Car Works in Philadelphia, the American Car Co., in St. Louis, and the Kuhlman plant, which turns out wooden, steam, interurban, city, work and other cars; also cars with steel bottoms and sides. Its specialty is interurban cars from 45 to 55 feet long; annual capacity, from 600 to 1,000. It also makes snow-plows, sweepers, etc.

Edwin R. Kent & Co., 10 South Canal street, Chicago, exclusive agents in the United States for the high speed, air hardening tool steel made by Edgar Allen & Co., Sheffield, Eng., have opened an office at 51 John street, New York, which will be in charge of Thomas E. Whiteside.

Plans and specifications for the construction of two new bridges across the river Neva, St. Petersburg, have been accepted. There are two other bridges over Russian rivers which may be constructed. Further information can be obtained from United States Consul-General Ethelbert Watts, St. Petersburg.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, March 9, at 4:30 p. m., B. M. Shaw, president, in the chair. The routine business was dispensed with in the usual manner, after which the following new members were elected: Sullivan Machinery Co., Claremont, N. H.; T. P. Kelly & Co., New York; Smith & Wallace, Woburn, Mass.; Cutter, Wood & Stevens, Boston.

At the afternoon session Herbert E. Field, of Ansonia, Conn., secretary of the metallurgical section of the American Foundrymen's Association, gave an interesting address on "Defects in Cast Iron; Their Causes and Remedies." Much information of value was brought out in the discussion that followed, which was participated in by Messrs. Kreuzpointner, Field and Doherty. The paper appears elsewhere.

Dinner was served at 6 o'clock, after which the evening session was addressed by Mr. Paul Kreuzpointner, of the Altoona shops of the Pennsylvania Railroad Co., Altoona, Pa., on "Trade Education for the Foundry." This paper was also discussed at some length, Messrs. W. W. Bird and C. L. Newcomb participating. The speaker exhibited specimens of castings made by a 12-year boy in one of the trade schools and they proved very interesting to those present.

Trade Education for the Foundry.

In his address, Mr. Kreuzpointner held that the present training in the public schools, with its development of the memory, the will, the intellect and the imagination in an abstract way without definite aim, should be so shaped as to bear a definite relation and lead to a direct exercise of the power acquired. He quoted from the report of the subcommittee of the committee of fifteen appointed by the National Educational Association to consider the subject of the correlation of studies in the elementary schools. This committee recommended that preference be given the objective and practical basis of selection of topics for a course of study, rather than the subjective basis favored in the past. Mr. Kreuzpointner then said:

"Thus we can conceive of a course of study in our common and high schools which, by a judicious correlation of the academic studies and manual training, connects the school directly with the outer world and serves as a basis for a general education, while, at the same time it prepares the mind for special or trade education where and when it shall be needed. Thus the high school of the future would, in the large cities, be separated into the classical high school, with a manual training department, to serve as a preparatory school for the classical university, and the manual training high school, with a suitable academic or literary course, to serve our industries. In the smaller cities the high school would lose the one-sided character it now has, as a purely preparatory school for college, abolish the unpedagogic division we now find in many high schools into a classical, scientific and commercial course, have a broad, correlated course of academic studies and higher manual training, branching off during the last year or two into special professional or trade lines as local conditions may require. Thus the 98 out of every 100 pupils who do not go to college would get the justice which they do not get now, while the few who go to college would receive all the preparation necessary and in addition that stimulus of industrial education which rounds out the harmonious development of the faculties. In other words, the high school of the future should stand more upon its own feet and become the people's higher industrial college without necessarily losing touch with the classical college for the benefit of the few who go there. According to the annual report of the Commissioner of Education for 1902 only 4.2 percent of the total school enrollment of the country are enrolled in secondary schools, and of these again 5.59 percent prepared for a classical college course and 5.07 percent prepared for a scientific college course. The total percent of high school graduates who prepared for college in 1902 is given as 31.72, showing what a small percentage of our total school enrollment the costly high school really serves while the great mass of industrial workers and capital invested in our industries receive but scant, if any, recognition at the hands of the common and high school.

"Please do not understand that I wish to depreciate the value of our high schools in the least. They certainly have been of incalculable benefit in the past and as far back as thirty years ago I faithfully helped to make our high schools popular. But conditions of life have changed and with it has come the necessity to make the high school available and useful to a much larger number of pupils under altered circumstances."

The speaker said that he did not think the technical college ought to be asked to assume the function of a trade school. "The technical college," he said, "is for the engineer what the manual training school is for special trades. For a college to subdivide its curriculum into trade courses will deprive it of its character as a college without having the facilities and conditions to give a practical course. It might do for a temporary stop gap, but the college is the loser without the foundry gaining much, because the college graduate who goes into the foundry is to be its manager and most likely does not know enough to impress his foremen and molders with his practical knowledge and possibly also lacks teaching ability. But even if he has, it takes rare tact for a college graduate to gain the confidence of the men to listen to him. I have seen a great deal of college graduates during the last 22 years, but the Dr. Moldenkes are very rare birds to be caught in the net of the foundry, or any other trade, for that matter. And under most favorable circumstances the foundry college graduate will find the expected remuneration for his talent only in large concerns of a special nature and therefore, whatever leavening power he may possess will be lost to the general trade. Hence, to accomplish anything for the common good of the foundry we have to fall back again upon our manual training in our schools with subsequent special or trade courses. Moreover, there is such a thing as the product of an industry becoming too expensive by too expensive education when the necessary efficiency can be acquired in less expensive schools than colleges are." The speaker quoted the late Prof. Thurston of Cornell University, who once said: "To educate our people as well as the people of the most favored parts of Europe we should have in this country 20 technical universities with 500 pupils each, 50 higher trade schools with 300 pupils each, 2,000 manual training high schools with 200 pupils each, and 20,000 teachers engaged in trade and manual training schools instructing 500,000 pupils. The cost of such education would be about 50 cents per capita per annum in addition to the present school tax." Mr. Kreuzpointner added that, assuming we are prepared to build up a system of trade education in this country, not only for the foundry, but for all trades, always provided that our common and high schools have given us a broad, general industrial education as a solid foundation upon which to build, it must be remembered that it will cost money and it must be considered that the contemplated trade schools must provide not only for apprentice boys, but also for the progressive mechanics and for the education of foremen and superintendents. The speaker discussed the plan suggested by Mr. M. P. Higgins, who was for 20 years in charge of the Worcester Polytechnic Institute, that a half day trade school, with shop work a half day and academic work the other half, would prove a solution for the question of how to give trade education to boys and men who are already engaged in working at a trade. The speaker regarded this proposition with favor. He said that while recently visiting Girard College at Philadelphia, he was surprised to find the rapid progress boys from 12 to 16 years of age were making due to this combination of shop and academic work. Boys leave the institute at about 16 years of age and often business men bid for their services, so that instead of receiving the customary $3 per week paid boys entering a shop, the Girard College boys receive as high as $9.50 per week. The speaker advocated teaching in common and high schools in such a way that the general education received in the schools will form a suitable foundation for a two years' course in special trades; this course to be the first two years of the high school for those who do not go higher, such schooling to be provided in separate buildings or sections of high schools by public taxation. Anything else, he said, would be a makeshift of little or no practical value. Technical colleges must be left for the training of engineers and the common and high schools for the training of the mechanic. In conclusion the speaker said that

no matter what efforts are made for industrial education they will be disappointing in their results unless it is impressed upon industrial workers that skill and knowledge of how to make a living are part of every man's duty and responsibility as a citizen.

The following were in attendance at the meeting:

Paul Kreuzpointner, Altoona, Pa.
Herbert E. Field, Ansonia, Conn.
B. M. Shaw and C. C. Hodges, Walker-Pratt Mfg. Co.
Wm. H. Bense, Kinsley Iron & Machine Co.
Alfred J. Miller and Alfred J. Miller, Jr., Whitehead Bros. Co.
Fred F. Stockwell, Fred A. Hoyt and S. M. Thompson, Barbour-Stockwell Co.
Henry A. Carpenter, A. Carpenter Sons Foundry Co.
Chas. L. Newcomb, Deane Steam Pump Co.
John G. Aldrich, New England Butt Co.
W. H. Coffin, Springfield Facing Co.
Jas. V. Sullivan and L. W. Penney, Saco & Pettee Machine Shops.
Geo. H. Lincoln and F. B. Foster, Geo. H. Lincoln & Co.
W. C. Griffith, Watertown, Mass.
Geo. J. Godsland, Salem Brass Foundry.
Theo. H. Colvin, Colvin Foundry Co.
T. R. Scott, Brown & Sharpe Mfg. Co.
A. L. Goodnow, L. H. Goodnow Foundry Co.
Wm. C. Doherty, Doherty Bros.
Jos. L. Anthony, Weir Stove Co.
R. W. Page, C. L. Peirson & Co.
Frank A. Wilson, Boston Labor Bureau.
W. M. Saunders, Saunders & Franklin.
W. B. Snow and Wm. Sangster, B. F. Sturtevant Co.
H. E. Stafford, Geo. W. Stafford Co.
C. A. Reed, N. E. Bartlett & Co.
Geo. B. Buckingham, Arcade Malleable Iron Co.
Geo. C. Belcher, Belcher Malleable Iron Co.
Morris L. Gay and Harwood Wilson, Rogers, Brown & Co.
C. Hitch Jr., American Tool & Machine Co.
F. D. Thorpe, Coburn Trolley Track Mfg. Co.
Wm. J. Breen, Agent Hugh W. Adams.
E. V. Hazard, Old Colony Foundry Co.
W. R. White, Pawtucket, R. I.
E. W. Anthony, W. C. Skulley and W. F. Savage, Smith & Anthony Co.
J. P. Barstow, Barstow Stove Co.
Geo. O. Sawyer, Hartford, Conn.
Walter E. Chase and H. W. Thomas, O. G. Thomas Co.
J. O. Henshaw, N. S Bartlett & Co.

Newspapers in Oklahoma and other Western States have recently given a large amount of space to descriptions of the wonderful prospects of the iron industry in Indian Territory. In response to a letter of inquiry, one of the gentlemen interested states that the chief promoter is Charles H. Hallett, a wealthy mine owner, and that on account of delays in obtaining mining leases, progress of exploration has been retarded. The so called iron hills are situated some six miles west of Vinita, I. T., in the Cherokee Nation. Iron ore crops out in numerous places and it is stated the last assay resulted as follows: Iron 66 percent, silver 4 percent, and copper 2 percent, with traces of gold. The promoters expect to begin work on the mines in 30 to 60 days. It is announced that Mr. Hallett will build a blast furnace and a steel plant. It should be noted, however, that the carrying out of these plans depends upon the amount of ore contained in the properties, and very little exploration has been done up to date.

The complete resumption of the Minnequa steel plant of the Colorado Fuel & Iron Co. depends upon the outcome of the coal strike, according to a statement made by President F. J. Hearne. If a sufficient supply of fuel can be obtained by April 1, work will again be started at the full capacity, and if the supply is not obtainable, the resumption of work will be postponed. Blast furnace C of the Minnequa works was blown in March 12. This is the first blast furnace to be put into operation since the general shutting down last November.

Among the exports of the United States to Porto Rico for the year 1903 were: Manufactures of iron and steel, $1,156,273, the largest items being boilers and parts of engines, $133,822; sewing machines, $96,804; other machinery, $141,106; pipes and fittings, $114,891; builders' hardware, $70,486; and sheets and plates, $66,633.

TENNESSEE COAL, IRON & RAILROAD CO.

Preliminary figures from the annual report of the Tennessee Coal, Iron & Railroad Co. for the year ending Dec. 31, 1903, were issued this week, though the annual meeting of the company will not be held for some weeks. The figures show an increase in net profits last year of $312,000 over 1902. Surplus earnings, after deducting $8,115 set aside for depreciation, increased about $321,000. The sum of $1,734,000 was carried forward to surplus account after charges, depreciation and preferred dividend. According to the report something like $2,300,000 was expended for construction and improvements during the year. The income account for the year ended Dec. 31 last, compared with the previous account, is as follows:

	1903.	1902.	Changes. Increase.
Net earnings from operation	$2,889,956.73	$2,595,095.20	$294,861.53
Other income	15,019.68	7,683.67	7,336.01
Total profits	$2,904,976.41	$2,602,778.87	$302,197.54
Less interest on bonds and dividends on guaranteed securities	739,527.50	750,283.09	*10,755.59
Net profits	$2,165,448.91	$1,852,495.78	$312,953.13
Deduct depreciation	411,422.41	419,536.82	*8,114.41
Surplus earnings	$1,754,026.50	$1,432,958.96	$321,067.54
Less dividends on preferred stock	19,864.00	23,174.66	*3,310.66
Carried forward to surplus account	$1,734,162.50	†$1,409,784.30	$324,378.20

*Decrease.
†Balance remaining to credit of profit and loss at close of operations in 1902, was written off against plant and equipment account.

During the year 1903 there was expended for construction and permanent improvement, including new blast furnaces now in process of erection at Ensley, new blowing engines, boilers, stock-bins, pumping station and water-purifying plant at Ensley furnaces, new boilers at Bessemer, Oxmoor and South Pittsburg furnaces, installation of electric haulage, pumping and lighting at No. 3 Pratt (coal) mine, with power to operate No. 4, new mining equipment at Red Mountain ore mines, Dolcito quarry and the Brown ore property at Greeley, Ala., and Bartow, Ga., addition to plant at the several coal mines, hot metal mixer, addition to rail mill, new electric power plant at Ensley Steel Works, new electric light plant at Bessemer, to supply Bessemer furnaces, rolling mills and iron mines, 204 new miners' houses, etc., the sum of $2,267,741; for purchase of land and the consolidation of mineral holdings, $97,934; for stripping brown ore, same to be charged to cost of ore as produced, $24,555; total expenditure for property account during 1903, $2,390,229. During the years 1901 and 1902 there was expended for construction and permanent improvements and for purchases of land the sum of $2,254,924, making a total expenditure for property account during the last three years of $4,645,153, all of which was paid for out of current earnings.

During the same period there was no increase in capital stock and the net indebtedness of the company was decreased $564,409. There has been charged off in the same time for depreciation on old plant and equipment (namely, that which was on the ground prior to Jan. 1, 1901), $3,687,801 and for depreciation on land (by reason of the removal of ore and coal), same being charged to cost of product as royalty, $663,276. The total amount charged off for the above reasons in the last three years is $4,351,077.

The Clonbrock Steam Boiler Co., Brooklyn, N. Y., has made an assignment. The concern has been engaged in the making of boilers and tanks and sheet iron manufacture at 240 Lorain street, Brooklyn.

The Sloss-Sheffield Steel & Iron Co. reports for the quarter ended Feb. 28 a surplus after charges and dividends of $142,428, against $458,612 in the same quarter the preceding year, a decrease of $316,184.

The Challenge Machinery Co., Grand Haven, Mich., recently made a shipment of presses and printers' material to Auckland, New Zealand. Nearly a carload of material was shipped a few days ago by that company to Central America.

Every department of the Pennsylvania Steel Co.'s plant at Steelton, Pa., was closed for several days last week on account of the flood which swept over that part of the State.

SLOSS-SHEFFIELD STEEL & IRON CO.

The annual meeting of the Sloss-Sheffield Steel & Iron Co. was held March 15. The report of President Maben is as follows:

The fiscal year of your company, which closed Nov. 30, 1903, was marked by extreme fluctuations in the iron market, not only in the price of pig iron, but in the demand and the urgency of delivery. The price steadily declined from the high point at the beginning of the year until it reached $9 on the basis of No. 2 foundry, and with the declining price the demand slackened; in no month during the year until October was reached did our sales even approximate the make of iron, so that at the close of the fiscal year we were carrying over 90,000 tons on our yard. The heavier sales having been made after the sharp decline in price, the average price for all the sales of the year was only 71 cents more than in 1901 and $1.03 less than the average for 1902. Our deliveries of iron during 1903 were 83,633 tons less than our production, which lessened our profits for the year, as no profit is computed on iron until it is shipped.

The following statement of the prices realized for iron in the last four years, and the profits for each year, is made in order that you may realize the steady growth and improvement in the business of your company. It will be noted that while the price realized for iron in 1900 was 12 cents a ton higher than last year, the profits from the same for last year were $396,294 greater:

	1903.	1902.	1901.	1900.
Average price of iron shipped	$13.66	$12.25	$10.51	$13.78
Profit on iron shipped	$1,139,146.00	$932,492.00	$311,407.00	$742,852.00

The operation of the Lady Ensley furnace, of which your company owns two-thirds, is not included in any of the foregoing statements, except as to the amount of iron on hand at the close of the year, although the price realized for the product of this furnace was the same as given in the statement.

The profit on coal and coke alone shows an increase of $184,206, as compared with 1901, and of $153,717, as compared with the year 1902, which is due to the increased product and improvements at the mines.

Blast Furnaces.

Reference was made in the last annual report to the condition of the Philadelphia and Hattie Ensley furnaces. Both of these furnaces have, during the year, been thoroughly refitted on much stronger lines, and have been doing good work since going into blast, and the cost of iron has been materially reduced. The Philadelphia furnace was blown out on Jan. 13 and her fires again lighted on April 18, and the Hattie Ensley was blown out on June 8 and again started Oct. 12. Additional boiler power has recently been installed at these two furnaces, as well as at the Lady Ensley. The four Birmingham furnaces are in good shape, having ample stove, boiler and engine power, though No. 1 is showing some evidence of giving away, and will probably have to be repaired before long. These four furnaces increased their output 53,500 tons over last year, or 32 percent, when they made an increase of 34,000 tons over the previous year, but the two furnaces in North Alabama show a decreased output of 30,000 tons, due to each of them having been out of blast for about four months undergoing repairs; still they show an increased product as compared with that of 1901.

Coal Mines.

The physical condition of the plants at all of your coal mines was maintained, though no important new work was undertaken during the year, except the bringing of water from the Warrior river to your Ivy mines, a distance of two and one-half miles, with reservoir, etc. The output of coal increased 17 percent, following an increase in the previous year of 24 percent; notwithstanding the closing down of all of the mines in Jefferson county during the entire month of July, owing to the stoppage of work by the members of the United Mine Workers' organization, pending a settlement of the wage scale.

In August some of the differences between the coal operators and the miners' organization were submitted to a board of arbitration, presided over by Judge George Gray. By the award of this board, no contention of the operators was granted, while the miners were given a two weeks' pay-day, a ruling against the transfer ability of time checks, and an advance of two and one-half cents on the minimum and maximum for cutting coal, with a corresponding advance in day labor, the highest rate ever fixed for mining in the district.

Iron Ore Mines.

SLOSS MINES.

No large expenditures were necessary at these mines during the year. Two new air compressors were put in, a few boilers added and some overhauling of the machinery done. The production of ore increased 92,598 tons during the year as compared with the previous year, and 155,291 tons as compared with 1901, or 70 percent.

RUSSELLVILLE BROWN ORE MINES.

The equipment of washers, steam shovels, dinkey engines and cars at these mines was given in detail in the last annual report. This has been well maintained. The product from this field is the only one which shows a decrease in output during the year, which was caused by a shortage of water for washing the ore, occasioned by an unprecedented drought which extended over 90 days. This decreased output, however, occasioned no inconvenience, as no furnace was at any time stopped for the lack of a supply of ore; the increased output at the hard ore mines having enabled us to furnish the limited amount required to make up the deficiency without adding to the cost of iron, as the hard ore is produced so cheap, and carrying, as it does, from 25 to 30 percent of lime, less flux is required than when running entirely on brown ore.

Coke.

The last of the 200 coke ovens, which were building at your Flat Top mines, were not completed until two months before the close of the fiscal year; yet the production of coke increased 96,147 tons over the previous year, and 210,000 tons over 1901, or over 61 percent in two years. Our coke capacity is now amply sufficient to supply all seven furnaces.

Comparison of Outputs.

Outputs for the years 1903, 1902 and 1901 were as follows:

	1903. Tons.	1902. Tons.	1901. Tons.
Pig iron	311,093	287,685	218,857
Coal	1,501,956	1,287,826	1,042,298
Coke	549,201	453,054	339,199
Brown ore	260,539	298,700	234,661
Red ore	377,080	284,482	221,789
Dolomite	115,035	101,069	101,349

The above figures of pig iron do not include the product of the Lady Ensley furnace, which produced 37,057 tons in 1902 and 51,330 tons in 1903.

Lady Ensley Property.

As was indicated in the last annual report, in April last a clear title to this large property, which had been in litigation for over nine years, was vested in this company by the court. The company having from time to time purchased all of the liabilities of the corporation, consisting of $2,000,000 of mortgaged bonds, $2,000,000 of stocks, and a large amount of judgment, bought the property at the foreclosure sale. The property consists of 16,000 acres of brown ore lands, partially developed, with ore washers, steam shovels, etc., and 14,000 acres of coal lands, a large proportion of it carrying the big seam, seven feet in thickness, with a going mine on it, having a capacity of 1,000 tons a day, a coal washer, miners' houses and 200 coke ovens.

The Southern Railway Co. in 1901 employed Mr. Joseph Squire, a mining engineer of high standing and character in this district, to examine the ore land in Franklin county, a large part of which was acquired through this purchase, and make a report, as they were desirous of ascertaining the resources of the country tributary to their road. We make the following extract from his report:

"In my estimate of the quality of brown ore on the above 18,400 acres, while there are some acres in said tract that have yielded 25,000 tons to the acres, still, after going over the territory, have formed the opinion that the whole 18,400 acres will yield an average of 6,000 tons of 2,240 pounds to the acre, making an aggregate of the whole amount to 110,400,000 tons of 2,240 pounds."

Your company acquired 14,400 acres in this tract, and in ad-

dition, 1,560 acres in Colbert county, through the Lady Ensley purchase, and 2,600 acres through purchase from other parties. The Lady Ensley property was acquired at a cost of $620,612.49, which could have been done only by the purchase of the liabilities from time to time, at greatly depreciated prices, while the company was in litigation. It was paid for out of earnings, and no securities were issued. Until legal possession of the property was had it did not appear in the statement of property account, as it was held in the name of a trustee, but the trustee account has now been closed and property account charged with the exact amount, which was paid in cash in the acquisition of the property. But for this transfer of accounts the increase in working capital would have shown larger for the year. We paid out for real estate (not including the Lady Ensley property), repairs to furnaces and improvements at the mines, $425,893 during the year.

Financial Statement.

Annexed will be found statements of resources and liabilities, earnings for the year, and of working capital employed in business, which should furnish such information as to the financial position of the company as you may desire:

FISCAL YEAR ENDING NOV. 30, 1903.

Resources.

Property account	$18,311,416 84
Treasury securities	259,700 00
Stocks and bonds of other companies	311,994 67
Cash, bills and accounts receivable	1,149,192 33
Supplies, raw and finished material at cost	790,071 12
Stocks in company's stores and warehouses	192,004 02
Extraordinary repair and renewal fund	208,548 29
Insurance and taxes unexpired	17,078 18
	$21,240,005 45

Liabilities.

Capital stock, preferred	$6,700,000 00	
Capital stock, common	7,500,000 00	$14,200,000 00
Sloss Iron & Steel Co.:		
Mortgage 6 % bonds, 1920	$2,000,000 00	
Mortgage 4½% bonds, 1918	2,000,000 00	$ 4,000,000 00
Current accounts		$ 469,646 37
Pay roll (balance of current month)		78,468 65
Bills payable		176,128 12
Profit and loss		2,315,762 31
		$21,240,005 45

STATEMENT SHOWING EARNINGS FOR THE FISCAL YEAR ENDING NOV. 30, 1903.

Profit on pig iron delivered: After deducting for depreciations on iron ore and twenty-five cents ($0.25) per ton on iron for extraordinary repairs and renewals		$1,139,146 59
Profit on coal: After deducting for depreciation		216,265 38
Profit on coke		175,901 02
Ore and dolomite sales		64,342 86
Rents, royalties, stores and other revenues		208,939 49
Two-thirds of earnings of North Ala. Furnace Co.		58,387 92
		$1,863,043 26

Deductions.

General expense, accounts not charged in cost sheets	$35,616 31	
Taxes and license	31,786 27	$ 67,402 58
Net earnings		$1,795,640 68
Year's bond interest		210,000 00
Surplus for 1903		$1,585,640 68
Year's dividends, 7 percent on preferred stock		469,000 00
Surplus for year 1903, after dividends		$1,116,640 68
Net surplus from 1902, after dividends		1,199,121 63
Surplus, Nov. 30, 1903		$2,315,762 31

Product of Lady Ensley not included.

Working Capital, Nov. 30, 1903.

Cash, bills and accounts receivable		$1,149,192 33
Raw and finished material on hand, at cost		688,035 14
Merchandise and supplies in company's stores and warehouses		294,040 00
Insurance and taxes unexpired		17,078 18
Treasury securities, stocks and bonds, at market value		397,839 45
		$2,546,185 10

Contra.

Bills payable	$176,128 12	
Pay rolls (balance of current month)	78,468 65	
Account payable (current business)	469,646 37	$ 724,243 14
Balance working capital in business		$1,821,941 96

Canadian Locomotive Plant Purchased.

The American Locomotive Co. has purchased the plant and business of the Locomotive & Machine Co., Ltd., of Montreal, Canada, whose works, completed last September, are located about two miles east of Montreal, on a strip of land between the St. Lawrence river and the Montreal Terminal railroad. This purchase gives the American company almost complete control of the locomotive business in Canada, its only competitor being a plant at Kingston, which has a capacity of less than 75 machines per year. The price paid was $1,500,000. The Montreal company will issue 4 percent bonds to that amount. Of these the American company will put $1,000,000 in its treasury and pay in cash the same amount to the stockholders of the Canadian corporation. In addition to keeping the bonds all of the stock of the Canadian company will be turned over to the American Locomotive Co.

A large wharf and pier adjoins the works, and these are utilized for shipping purposes, giving the company a through water route to Europe as well as to the Great Lakes. The capacity of the works is from 150 to 250 locomotives a year, besides a general business in machine and structural work, steel buildings, bridges and roof trusses. Nine buildings comprise the plant. These are a machine shop, 420 x 132 feet, a foundry 220 x 65 feet 5 inches, a boiler shop 380 x 67 feet, an erecting shop 340 x 66 feet, a smith and forge shop 340 x 66 feet, a two-story pattern shop 109 x 63 feet and a power house 105 x 71 feet. A structural shop about 310 x 63 feet is to be built in the near future, also a steel foundry. The area in square feet of the several principal buildings is as follows: Machine shop, 55,440; erecting shop, 22,440; foundry, 14,388; boiler shop, 25,460; smith shop, 22,440; total, 140,168 square feet.

The American company has found the heavy import duty imposed by Canada a serious handicap upon its operations in the Dominion and it expects to meet the demand which has resulted in the importing of 326 locomotives into British North America, in the past three years, from the United States. President Callaway, of the American Locomotive Co., says that the Canadian plant will be immediately put in order to build from 150 to 200 locomotives per annum. It is expected also that the large plant for manufacturing structural steel and bridges, belonging to the Montreal company will soon be run to its fullest capacity. Within a short time it is expected that 2,000 men will be employed in the Canadian plant. Roger Miller will remain in charge of the Canadian company's interests in Montreal.

Kilby Manufacturing Co.

A meeting was held in Cleveland on Tuesday, March 15, at the office of Squire, Sanders & Dempsey, of the various creditors of the Kilby Mfg. Co., of Cleveland, in response to letters inviting a conference. In view of the unfavorable conditions in the beet sugar industry, from which the Kilby Mfg. Co. receives heavy orders for machinery, payments for such work have been slow and the Cleveland company has been compelled to accept large amounts of renewal paper. In turn it sought extensions from its creditors, which, after a careful canvass of the situation, the latter unanimously decided to grant. A committee consisting of the following was appointed to co-operate with the management of the company in carrying out the plans that have been suggested to meet the present difficulty: E. H. Bourne, Thos. H. Wilson and John F. Whitelaw, representing Cleveland banks; John G. Ward, of the Babcock & Wilcox Co., New York, and M. H. Barker, president of the American Tool & Machine Co., Boston.

Eight iron molders' unions of Chicago will submit to the city council a plan for a municipal iron foundry. The molders claim that contractors charge excessively high prices and have work done in other cities, while molders of Chicago are idle.

SHAFT HANGERS OF PRESSED STEEL.

It is a well known fact among engineers and users of machinery that the modern machines have to produce more, and work faster, or in other words are under a greater strain than formerly. This means that transmission machinery is subjected to harder service than ever before. As competition grew keener, it became an absolute necessity to save wherever possible, and as decreased weight reduces the cost, the result is that cast iron hangers have been made lighter and in most cases weaker, at the same time as the work they perform has grown more severe. Let a pulley slip on the shaft, a bearing get hot, or a hanger break, and a whole shop, or at least a portion of it, will have to shut down until the trouble has been fixed. An untimely shutdown always incurs loss of time and money, in addition to a possible loss of life and property. It was by reasoning along these lines, and by thoroughly appreciating the importance of this matter, that the "American Pioneer" pressed steel shaft hanger came into existence. Increased strength, if possible, reduced weight, rigidity, complete adjustment, ease and convenience in handling, and last, but not least, safety; all were demands which it was acknowledged had to be satisfactorily dealt with before it could be claimed that the desired shaft hanger had been produced, and it is the object of the following description to show how the new hanger combines these features and meets the requirements.

Considering what was required of the new hanger frame,

FIG. 1.—A NEW PRESSED STEEL HANGER.

and having decided that neither cast iron nor any other cast metal should be used in its construction, it was but natural to select rolled open-hearth steel for this purpose, because this as is well known, is many times stronger than the very best cast iron, besides being homogeneous throughout at the same time as it is particularly adapted to being worked in dies and pressed to shape. The illustration shows the four-way adjustment pattern of the new shaft hanger. It consists of two pressed steel legs each strongly ribbed and flanged throughout its entire length to insure rigidity combined with lightness, and so shaped at the one end as to provide a strong and broad foot to form a solid base where bolted to the footing piece, while the other end is quite narrow and designed to fit the lower cross piece or clamp. Attention is called to the fact that ample bearing surface is provided for the bolts securing the clamp to the legs. By examining the design of the leg carefully it will be found that special attention has been paid to the proper distribution of metal, or, in other words, that maximum strength has been provided where maximum force is applied. A flanged and corrugated plate of pressed steel connects the two feet and is securely riveted to them so as to maintain their proper distance, and otherwise insure rigidity, stiffness and ease of handling. This plate being corrugated and flanged is very strong and stiff, although made of very light stock.

The brace connecting the two legs at the upper part of the parallel portions is made of pressed steel and strongly ribbed and flanged, and can practically be considered as being in one piece with legs as it is riveted to each of them by six rivets, of the best Norway iron. Besides acting as a brace in adding to the lateral and transversal strength of the structure, this part as will be seen, also affords the means for taking the thrust transmitted through one of the vertical adjusting screws. The brace, having deep and strong vertical sections, is well adapted to serve this purpose.

FIG. 2.—HANGER WITH BEARING RELEASED.

The clamp already mentioned is made of pressed steel and shaped so as to offer a strong U-section with which to resist the bending moment due to the thrust of the other vertical adjusting screw, as will be clearly seen from the half-tone. The clamp fits outside the narrow ends of the legs to which it is secured by two accurately fitting bolts. Besides taking the thrust, the clamp also serves the purpose of tying the narrow ends of the legs together, thus greatly strengthening the whole structure. In this connection attention is called to the fact that by removing one of the bolts securing the cap, this can be swung like a hinge with the other bolt for a fulcrum.

The bearing consists of three main and separate parts: An upper and a lower half bearing and an oil pan, all made of cast iron. On the top of the upper and on the bottom of the lower bearing these halves are fitted with spherical surfaces having their common center in the shaft axis. A socket of the same radius as that of the spheres is fitted centrally on he inside and in the bottom of the oil pan, which is made large enough to keep sufficient oil for lubrication, and at the same time to accommodate the lower half bearing, while a recess located centrally on the outside of the oil pan is provided for the lower adjusting screw. Thus, when the complete bearing is put together and fitted between the adjusting screws, the two half bearings which bear on each other their full length are supported on the socket in the bottom of the oil

FIG. 3.—THE BEARING OF NEW HANGER.

pan, and as plenty of clearance has purposely been provided between this and the half bearings wherever necessary to insure independent motion these are left free to adjust themselves to fit the shaft, while the oil pan remains *stationary*. being firmly held by two horizontal and one vertical adjusting screw. The vertical adjusting screws are fitted in slotted holes, and, providing for liberal vertical movement, also allow ample side adjustment—this latter being determined

by the horizontal adjusting screws. To prevent the objectionable dripping of oil automatic wipers have been fitted.

The bearing just described is designed for ring oiling. The rings are made of tempered spring steel and will retain their original circular shape, thus insuring reliable and continuous lubrication. If any other method of lubrication is desired it can be promptly furnished.

By inverting the hanger an equally suitable floorstand is provided. A pressed steel post hanger of wall bracket type is being made, the main features of which resemble those of the hanger already described in so far as its various parts are strongly riveted and flanged.

The details of the "American Pioneer" pressed steel shaft hanger have all been carefully computed and actually tested; comparing the calculations and experiments with those of cast iron hangers of standard designs. As a result of these investigations, it is now possible to make a hanger frame which stripped weighs only 2-5 of the ordinary cast iron one intended for the same shaft and service. With boxes complete, the ratio between the weights of the pressed steel and the cast iron hanger is as 1 to 2.

To the millwright whose job it is to erect the shafting, etc., the fitting of the steel hangers will mean a great saving of time and labor, having so much less weight to handle in places difficult of access, and undoubtedly the mill architect will be most favorably disposed toward the steel hanger, as in a big mill the load on the floor beams, etc., will be greatly reduced. The sole manufacturers of the pressed steel shaft hanger are the Standard Pressed Steel Co., of Philadelphia.

American Visit of British Mechanical Engineers.

The Chicago meeting of the American Society of Mechanical Engineers will be a joint convention of the British and American societies of mechanical engineers and will begin on May 31. The secretary of the British society has advised the A. S. M. E. that the purpose of many of the visiting members will be not only the meeting and the exposition in St. Louis, but the privilege which the American trip will give them for study of establishments and methods. The suggestion has been made that during the continuance of the British visit in May and June there should be organized in each city a bureau of information in the office of one of the members, for the rendering of personal service in the way of advice. The earlier this can be carried into effect by the general consent of the members in each city the sooner visiting members may be notified of the plan. By this means the visitor can be instructed as to the establishments he wants to see, how to reach them and for whom he is to ask and present his credentials. These centers of information, as well as the secretary's office in New York (12 West 31st street), should receive catalogues of interest from firms, whether or not they are represented in the membership of the society.

The Walter A. Zelnicker Supply Co., of Mobile, Ala., has been incorporated for the purpose of transacting a mill, railway and factory supply business. The capital stock of the new company is $90,000, fully paid in. The officers are: Walter A. Zelnicker, president; Wilson Ashley, vice president; Jas. H. Zelnicker, secretary and treasurer. The incorporators are the officers and Mrs. Ella W. Stanton and Boykin B. Boone. The new company will absorb the business now conducted as the Mobile branch of the Walter A. Zelnicker Supply Co., of St. Louis, and the business of Chas. W. Stanton & Co. The stock of the Walter A. Zelnicker Supply Co. will be removed from its present location, St. Louis and Commerce streets, to the store now occupied by Chas. W. Stanton & Co., 13 and 15 South Commerce street. The new firm will be under the active management of Jas. H. Zelnicker and Wilson Ashley, both of whom have been closely identified with the origin and growth of the mill supply business in Mobile for the past ten years.

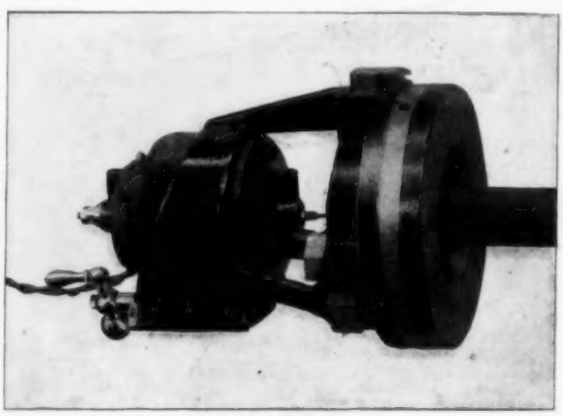
The Jacobson Machine Mfg. Co., of Warren, Pa., has opened an office in Pittsburg, Pa., at 603 Farmers Bank building, with E. A. Arnold in charge. The company manufactures gas engines up to 300 h. p. capacity and the Jacobson stationary bottom vise so well-known to the trade.

A PORTABLE CENTERING MACHINE.

A portable device for centering shafting, as well as square, hexagon and other sections, has been brought out by Frank H. Hudson and H. O. Russ, the former being the inventor, of State street, Boston, Mass. The machine as illustrated consists of a universal chuck fitted to a frame which in the present instance is made of an alloy of aluminum and this holds in the opposite end a motor, with a drill and countersink in alignment with the axis of the chuck. The motor travels in a gibbed slide and is operated by a feed screw and handle, causing the drill and countersink to enter the end of the centered bar held in the chuck. Wear and play are taken up by means of slides and set screws, as shown, at the base of the casting. A stop bar or strap across the inside of the chuck opening protects the drill point from being brought into too sudden contact with the end of the bar, through careless handling when placing the machine in position for work.

It will be seen that this machine entirely changes the method of centering stock for lathe work, inasmuch as the device is carried to the bar wherever it may be lying, obviating the necessity for carrying a heavy shaft to a centering machine or centering in the old-fashioned way in a lathe.

The motive power is obtained from any electric fixture of 110 volts, direct current, or it can be operated by a small storage battery. The application of the power is controlled by a switch on the rear of the motor. The machine can be made in different sizes for large or small work. The tool shown measures 10 inches in length, the outside diameter of



A PORTABLE CENTERING MACHINE.

chuck is 8 inches, weighs about 25 pounds and has a capacity for centering bars from 0 to 4 inches. The work is done accurately and speedily and is a great advantage over usual results, particularly as cropped or roughed ends do not need to be cut square before centering. It is a thoroughly practical, serviceable little device, and when not in use can be laid away in the tool room.

Londonderry Iron & Mining Co.

The Londonderry Iron & Mining Co., of Londonderry, Nova Scotia, has recently blown in its furnace A, and is now turning out an excellent quality of foundry pig iron. The plant and property owned by this concern were acquired from the late Londonderry Iron Co., Ltd., which succeeded other companies which have engaged more or less vigorously in the manufacture of pig and other iron products at Londonderry during the last fifty years. The plant consists of two furnaces, but only one of these has been rebuilt and put into commission. All modern improvements have been put in and as the original structure, built about twenty-five years ago by one of the best English makers, was in excellent condition, the whole outfit should give very good results. Its dimensions are: height 75 ft., bosh 17 ft., hearth 10 ft., stock line 11 ft. The hot blast stoves, boilers, blowing engines, pumps, etc., have all been thoroughly renovated. The company's supplies of ore are drawn almost wholly from ores mined in the immediate vicinity of the works and on the company's property. Over 30,000 acres of mineral and timber land have been acquired by the present management. The old

levels and shafts have been put in good working condition and new levels have been driven in promising ground under the direction of W. F. C. Parsons, resident engineer. The result of these new workings has been most satisfactory and large stocks of ore have been accumulated. What little outside ore is required for mixing purposes is brought from other iron mines in the provinces within reasonable distance. Limestone and fuel are plentiful in the vicinity of Londonderry, that town lying equidistant between the coal fields of Pictou and Cumberland counties, N. S. The head office of this company is in Montreal, and Mr. Thos. J. Drummond is president and F. G. O'Grady, secretary-treasurer. Geo. Beatty is superintendent at Londonderry.

The Montreal Pipe Foundry Co., whose Eastern works are located at Londonderry, is a large consumer of the product of this furnace. The pipe company has completed its new buildings and the installing of new plant to replace what was destroyed by fire in July, 1902. This company has a large capacity for all classes of cast iron pipes and miscellaneous castings, and fully meets the demand of the Maritime Provinces in these lines.

The property of the Grant Tool Co., Franklin, Pa., recently sold at receivers' sale to William J. Bleakley, has been conveyed by him to the Franklin Machine & Tool Co. The officers of this company are: Charles Miller, president; W. J. Bleakley, vice president; E. W. Snook, treasurer; and T. C. Uran, secretary.

A DERRICK FOR HANDLING ASH BUCKETS.

The New Jersey Foundry & Machine Co., of Murray street, New York, N. Y., has recently completed the erection of an eight-ton traveling derrick for the American Railway Traffic Co., of Brooklyn, which is being used by the latter in connection with its system for disposing of the ashes of the city of Brooklyn. The derrick was designed by the New Jersey Foundry & Machine Co., with the assistance of Mr. C. R. Van Etten, of the American Railway Traffic Co., and Mr. Taylor of the Brooklyn Heights Railway Co. The derrick is used to unload steel ash buckets from trolley flat cars and dump the ashes on to the fill which is being made at Neptune avenue, near Brighton Beach. The weight of the loaded buckets is approximately eight tons, and the method of dumping the buckets is clearly shown.

ASH UNLOADING APPARATUS AT INSTANT OF DUMPING THE BUCKET.

The derrick is of extra heavy wooden construction, reinforced by heavy tie rods and gussets, and designed throughout for severe wear in continuous service. One of the largest sizes of the Lidgerwood electric hoisting engines is mounted on the rear of the derrick, the hoist being operated by a 50-h. p. General Electric Co.'s railroad motor. The effective radius of action is 30 feet, and the boom swings through 170 degrees. The derrick has been working day and night for several weeks, and for a large part of this time has been unloading buckets at the rate of four cars an hour, or one bucket every four minutes. The fastest work up to date has been one carload of four buckets in 8 minutes.

High Unit Labor Cost and Its Effect on Prosperity.

BY THOS. D. WEST.

No country was ever made great in all that pertains to the peace, comfort and happiness of its common people either by low or very high wages. A wage rate that compels from 15 to 20 thrifty adults to live in one house, without carpets, curtains and good furniture, and without proper food and clothing—a house that should be occupied by only four to six adults, and these enjoying a fair share of the luxuries of life, is ruinous to prosperity.

To have prosperity we must have business. To have business we must have things to manufacture and sell, which can give employment to all classes of people. If we do not purchase any carpets, curtains, good furniture, food and clothes it cuts out that much employment for labor. The business man or capitalist that is anxious to have his country lead the world will maintain high wages as far as he can; and the workman who desires to have his country pay high wages

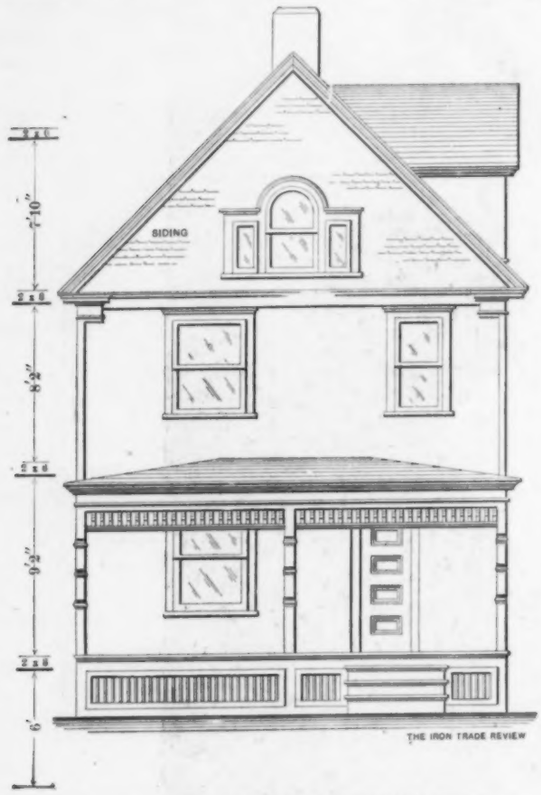


FIG. I.—FRONT ELEVATION OF WORKINGMAN'S HOUSE.

steadily to its masses will strive to give an equivalent in physical or mental energy, and will deserve such wages by laboring to cheapen wealth.

If we concede the claim that labor creates wealth, must we not also concede that wealth will be dear or cheap in proportion as labor gives an equivalent for the wages it receives? If, for an example, the labor of 3,000 hours of active, earnest workers at an average of $3 per day could hew down free timber, haul it to the mills, from there to a lot and erect a house ready for the plasterers, we would have the creation of $900 in wealth, minus that which remunerates invested capital. If, by reason of inactivity or limitation of output, labor does not give a good return for good wages, and this same house costs $1,500, we would then have the cost of a certain amount of wealth increased two-thirds or by $600. The difference between $900 and $1,500 is a great barrier to prevent many workmen from owning their own homes and reacts in depriving them of other luxuries and pleasures of life.

The cheaper labor can make wealth, the more of it labor can possess. When labor, by its own inactivity or limitations of output, increases the cost of wealth or product, it injures itself more than it injures the large owners of accumulated wealth.

The foundation of our country's supremacy in all that makes it the best on earth for the workingman, was not laid by strife to limit labor's performance. Had such a sentiment ruled labor in the past as it does today, we could not now point with pride to the stars and stripes. It was willing work and the ambition to excel in all mental and physical efforts that made our country the best on earth for the workingman, as is shown by the fact that most of our great and successful men have come up from labor's ranks.

The great decline of prosperity in the last three months of 1903 brings a lesson that those truly concerned for the welfare of labor should study earnestly and with unbiased mind. It well illustrates what we may expect every time wealth is dearly bought. It is a wonder that the crash did not come sooner, for wherever one traveled he could often find three men doing two men's work, and receiving four men's pay, with the watchword that all were equal, and that he that did not strive to limit output was no friend of labor's cause. In many cases the manufacturer would have to pay some very poor tool of a mechanic the same wages as were paid a master mind, and all were so independent they cared not whether their boss was pleased with their work or not, how much property they destroyed, or what loss strikes might cause, as they could go most anywhere and find another boss glad to engage them. The conditions were such that if a firm contracted for any certain structure, the contract price would generally be a third or more than in normal times, and the chances were that before the work was finished, even without strikes, more funds had to be forthcoming than the most liberal allowance made at the start, resulting in so raising the cost of wealth that enterprise was discouraged and at length collapsed, while thousands of men were thrown out of employment.

It is not to be understood by the above that objection is raised to high wages. We favor a high wage, but we do not advocate the combination of high wages and studied effort to limit output, for such limitation is most injurious to the wage earner in preventing him from obtaining comforts and pleasures that he could otherwise enjoy, and in retarding or destroying prosperity, which is the workingman's best friend.

All is not gold that glitters and not all that present day trade unionism advocates is what it believes it to be. Things are not always what they appear on the surface; and we are often compelled to go very deep to discover what effect ruling policies really have on our condition.

Labor has made many mistakes in striving to better its conditions; and among the greatest is its fight for limitation of output while receiving and contending for high wages. No policy could do more to prevent obtaining high wages, especially for long periods.

Another point which may well be referred to here is that the necessity oftentimes of having to engage three men to do two men's work had much to do with forcing employers to use alien labor during the prosperous times of 1901-1903. Employes, taking prosperity as a license to loaf, compelled many firms to carry more men than they required. As an example, our own firm had to carry, as our books could show, fully 25 percent more employes on our payroll than were necessary, in connection with less work being done per man than was accomplished in the times when men had some interest in holding their jobs, and were not so fast to say, "If I don't suit you get some one else." Labor has railed at employers because they sought to obtain Slavs and Huns to assist in getting out their product. In too many cases labor has only itself to blame, for, had men worked with the same spirit as in normal times and not sought to limit output, many employers would not have been party to flooding this country with undesirable immigrants, who also, now that times are dull, help greatly to lower wages. Many workmen honestly believe that employers as a rule were glad to encourage and engage alien labor, but we know that they are mistaken. As a rule employers much prefer English-speaking or American-born labor if the men will only meet them half way in complying with what they believe labor should do in this high-wage country. The employer has long learned that he cannot expect the reasoning and sympathetic support from the ignorant foreigner that he can from the American citizen.

As few workmen comprehend the great cost of labor com-

pared to that of material which is generally involved in all manufacture and construction work, a study of the following figures should be very instructive and profitable.

It is claimed that 80 percent to 90 percent of all the outlay involved in the manufacture of iron and steel goes for labor. As an example in considering the labor cost of a ton of pig iron, selling now at $14 per ton, we set off $11.90 as paid for labor in one form or another per ton. By an increase of 20 percent we would raise this labor cost to $14.28 per ton. This would increase the wealth embodied in a ton of iron $2.38, or raise the price so as to make a ton of iron sell at $16.38, without allowing anything for capital invested. If, in addition to the above increase of $2.38 per ton for labor, the employes contend for limitation of output so as to make it necessary to have three men do two men's work, we increase the cost of labor one-half of $14.28, making the total labor cost of making a ton of iron about $21.42.

If, instead of labor contending for limitation of output, efforts were put forth to create greater efficiency—to have, for example, one and one-half men do two men's work, we would then have a reduction of 50 percent in the selling price.

As another illustration we will take the building of a workingman's house to cost about $1,000, and in which, on account of there not being the investment of capital necessary to get out the lumber, etc., as there is to make iron or steel, the labor cost is estimated to be about 90 percent of the total expense, thus making the labor charges $900. An increase on this of 20 percent in wages brings the labor costs up to $1,080. If, on top of this, limitation of output causes three men to do two men's work, the labor cost is increased to $1,620. Adding 11.11 percent to this for remuneration of capital invested we have a total cost of about $1,800, or an increase of $800; whereas, if labor strove for greater efficiency, so that one and one-half men did two men's work by reason of higher wages we would have the $1,000 house cost $900, a reduction of 50 percent from the cost resulting from the effort of labor to limit output.

To give a better idea of the great labor cost attached to manufacture and construction work, in comparison with that of the raw material utilized, we will itemize the cost of material and labor for the construction of a house after the plans seen in Figs. 1, 2 and 3. This plan and the approximate estimates given in Table I were kindly given the writer by J. H. Shaw, of the firm of Wallis & Carley, Sharon, Pa., contractors of large experience, and the plan has served for many houses which were erected by them during 1903. It will be noted that the total cost of this house is $1,645. The labor cost is 91.81 percent of the total.

TABLE I.

Materials used.	Cost of Materials.	Cost of Labor.
101 yds. excavation	.....	$ 35.35
39 perch stone	$ 9.75	185.25
3 cellar windows	1.50	4.50
15,000 ft. lumber	75.00	405.00
1 square gable shingles	.50	6.00
6 columns	1.00	18.00
14 square slate	7.00	77.00
15 windows	7.50	105.00
18 doors	9.00	126.00
1 book case	1.50	13.50
1 cupboard	1.50	23.50
1 mantel	2.00	38.00
2,400 brick	.....	48.00
680 yds. plaster	10.00	195.00
Tin work	1.00	20.00
Painting	5.00	135.00
Hauling	.40	20.00
Nails	1.00	15.00
Hardware	1.25	40.00
Total	$134.90	$1,510.10

Having treated of costs pertaining to manufacture and construction work we will turn our attention to that of produce, those things which man must have, be he ever so poor. Foods, above all else, are a form of wealth that labor should strive to produce at the lowest cost possible, but instead of this we find every exertion being made to have the opposite prevail, as can be seen by the following:

"CANNOT WORK ON HIS OWN FARM."

The *Iowa Homestead* reports what has followed unionizing of farm labor in some localities. "The rules sought to be enforced constitute a most comprehensive code. It is provided that wages shall not be less than $2 to $3 per day. The employing farmer not being permitted to be a member of the union, is forbidden to ride a reaper or to do any work under penalty of being boycotted as 'unfair.' The same prohibition applies to his wife and minor children. The work on the farm is said to belong to the members of the union, and owners and their families are not allowed to touch it, just as employers of union labor in factories are not permitted to give personally one productive turn to the machines which they own. It was the idea of the hired union man that the farm owner should sit idly on the front porch with his family, while hired men at union wages do all the work."

By the above Iowa union rules, the farm employes place a limitation on output that must enhance the cost of produce nearly 100 percent. Men with power to compel a farmer and all his children to sit in idleness can go to any extreme in

FIG. 2.—FIRST FLOOR PLAN.

decreasing their own exertions, and in being careless or destructive. If any body of men can enforce the policy of having three men do two men's work, it is the Iowa farm labor unions, where they have full control. Taking the increase in cost from this source in connection with the enforced idleness of the farm owner and his children, who have the greatest incentive to high efficiency of labor, we think it entirely reasonable to say that their enforced idleness increases costs a second 50 percent, making the total the 100 percent stated above. If unionizing of labor ever "kills the goose that lays the golden egg," it is when seeking to limit the output of farm products.

In treating of the necessities of life, we have clothes as well as food to consider. Today a workingman can purchase a good suit of clothes for $10, but should present wages be increased 20 percent we would pay $12 for the same suit. This increase could be met by most men, but if added to this, by limitation of output, three persons are to do the work of two,

the price would be raised to $17.50, which to many people would make the difference between wearing good apparel and shoddy.

Another example of labor enhancing the cost of wealth to its own injury, lies in placing the large majority in any trade on a level in the matter of the wage rate. Structural iron workers for example, compel a contractor, where they can, to use a man at $5 to $6 a day to heat rivets—work that a boy at $1 a day could do. They demand the employment of the same high priced labor to unload cars, carry lumber and erect staging, etc., which could be done by labor costing but $1.50 to $2.00 per day. Aside from this, all accepted skilled men are scheduled to receive the same wage rate, even though some had twice the brains and skill of others. The injury labor does itself by the enforcement of such rules is as great if not often greater than comes from limitation of output.

The rapid increase of wages, limitation of output, restriction of skill, and engaging skilled men to do boys' or common laborers' work, through the years 1901 to the fall of 1903, enhanced the cost of construction and enterprise to such an extent as often to make costs about double what they should be; and when strikes continued, further blocking industry and increasing cost of construction and operation, it was more than any country could stand, no matter how rich in natural resources. This was a prime factor in the collapse of prosperity in the last half of 1903, which threw thousands out of employment and caused heavy reductions of wages for those that could obtain employment.

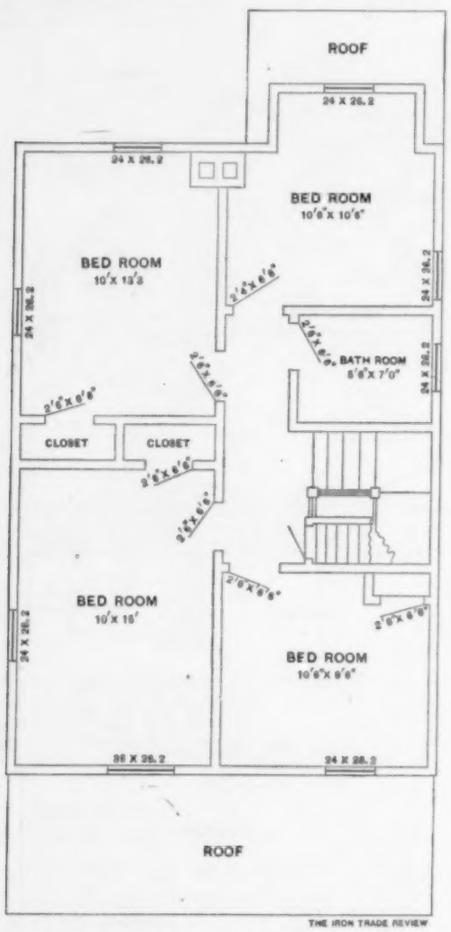


FIG. 3.—SECOND FLOOR PLAN.

It is the belief of many workingmen that it makes little difference if the necessities and luxuries of life are high as long as high wages are paid. If those of such belief would only think deeply they would discern the fact that the increase of wages in spurts of prosperity rarely keeps pace with the increases of prices for the necessities of life (largely due to limitation of output), and the discrepancy keeps working people constantly complaining of their hardships in making ends meet. This is most noticeable during the first decline of prosperity, as at such times wages go to a low level considerably before the necessities of life come down correspondingly. The workingman generally suffers most by any decline of prosperity, and he above all should strive to encourage a continuance of steadily favorable conditions.

The American workmen can excel any other nationality in turning out quality and quantity. The seed of their extra efficiency was sown many years back. It is in them to give an equivalent for the highest wages, and this entitles them to a life of comfort and happiness. But if they continue striving to limit output, we will soon come to stand no higher than other nations and the snap and push of our fathers who laid the foundation of our glorious republic will be no more. Some will argue that if all workmen strove to be the most efficient, employers would only take advantage of the extra efficiency to increase their own profits. Those of this mind have had little or no experience in business; if they had they would know that competition drives employers to sell their products as cheap as they can in order to secure business, bringing us back to the cold fact that the consumer is as a rule the one to reap the most benefits from all extra efficiency of labor. This redounds to the interest of labor more than of capital, as it has long been conceded that wage earners are the greatest consumers, their greater numbers accounting for the creation and support of about nine-tenths of a progressive country's farm and shop industries. Labor itself is therefore the greatest beneficiary of the development of full efficiency in the workingman, thus cheapening wealth all he can. We are noted for our great advancement in labor-saving appliances but this will not maintain our supremacy if our labor continues to work to the opposite end.

Our country having the best labor-saving appliances and the greatest natural resources, it only remains for the employer to do all in his power to sustain high wages (as some are doing) and the employe to encourage efficiency in labor, in order that our nation's wealth may give to the masses of the people the greatest possible comfort and happiness, such as may continue to command the attention and respect of the whole civilized world.

Waukesha Sheet Steel Co.

The Waukesha Sheet Steel Co., Waukesha, Wis., has been ordered to surrender the premises it now occupies to the Wisconsin Central railroad. It is claimed that the steel company has failed to comply with the contract with the Wisconsin Central and legal steps have been taken to compel it to vacate the buildings now occupied. The Waukesha Sheet Steel Co. leased the property in 1901 and in the spring of 1902 the first sheets of steel ever rolled in Wisconsin were turned out from the mill. During most of that year the company continued active business, although constantly hampered with difficulty in securing billets from which to roll the steel into sheets. The prices of the billets were so high that the steel could not be sold profitably, and finally the mills were shut down. J. E. Jones and F. J. Patterson invested heavily in the plant, and business men gave a bonus of about $8,000. The directors of the company contemplate reorganization and expect to enlist some new capital. An attorney for the Wisconsin Central advises us that the railroad company is friendly to this plan.

J. Frank Aldrich, the trustee in bankruptcy for the New York Car Wheel Works, Buffalo, N. Y., filed a formal schedule of objections, on the 4th inst., to the claims of the North American Trust Co., of New York, for $94,694. The claim has been allowed by the referee in bankruptcy and a dividend of 10 percent paid on it. The trustee now asks that the entire claim be expunged and that the Trust company be made to refund the dividend. It is charged by Mr. Aldrich that the claim was leased on three notes which represented the unpaid portion of a debt of the P. H. Griffin Machine Works to the Trust company and that the car wheel works agreed to pay the debt of the other company in which P. H. Griffin was interested. It is charged that the debt assumed by the car wheel works was unauthorized and illegal as no consideration was received. The matter will be given a hearing on March 18.

PNEUMATIC CLAM SHELL BUCKET.

The pneumatic clam shell bucket brought out by the Chaquette Dredging & Contracting Co., of New York, is illustrated in Fig. 1, and Fig. 2 represents the pressures on the cutting edges. The bucket has been designed for excavating or handling in bulk under diverse conditions, material offering variable resistance and is therefore well adapted to bituminous

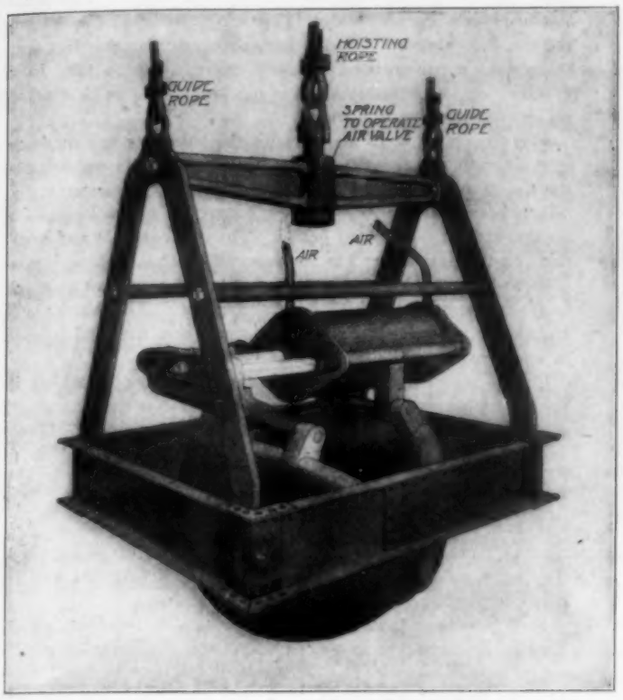


FIG. 1.—PNEUMATIC CLAM SHELL AND SUPPORTING FRAME.

coal, iron ore, etc. The jaws are closely fitted with a cover, and when closed the fitted jaws lock by the pressure of the air on the piston and prevent leakage. The cover prevents the material being washed away when the bucket is hoisted with speed from unusual depths. The device is equipped with single hoisting cable, one air pipe and counterweighted guide ropes. The closing of the bucket is entirely automatic and is practically instantaneous as the jaws settle into the material. The penetrative power of the jaws is, however (as far as this may be in excess of that due to the weight of the bucket and frame), at all times within the control of the operator, who regulates the grip of the jaws on the material by an increase or decrease of the air pressure on the piston.

The main hoisting cable is attached to a drawbar in the frame and this bar enters a coiled spring. When the clam shell comes to rest upon the material the spring expands with the slackening of the hoisting cable and the extension of the spring is used to operate a valve which admits the air pressure to the cylinder and thereby effects a prompt and automatic closing of the bucket.

Some calculations have been made by Mr. William A. Fairburn, consulting engineer to the company, and these will be understood in connection with the diagram in Fig. 2. The total length of the cutting edge on one side equals 75¾ inches. The center of gravity of the cutting edge measured from the shaft A is 20½ inches. The area of the piston equals 201.5 square inches and the total pressure at 100 pounds pressure to the square inch will be 20,150 pounds. The center of the cylinder bearing above the shaft A, clam open, equals 19½ inches, and the corresponding uniform total pressure on the cutting edge amounts to 19,175 pounds, or 266 pounds per lineal inch for each side. The center of cylinder bearing above the shaft A, clam closed, is 5¼ inches and the corresponding uniform total pressure on the cutting edge equals 5,420 pounds or 71.4 pounds per lineal inch for each side. The pressure on the cutting edge, clam open, due to 6,000 pounds weight of bucket and frame, is equivalent to 39.6 pounds per lineal inch for each side.

The mode of operation is as follows: The claim shell is lowered open upon the material and then has a penetrative force of about 40 pounds per lineal inch for each cutting edge due to the weight of the machine. The slackening of the cable as the bucket settles to rest, admits 100 pounds air pressure to the 16-inch cylinder and thus there is applied to each shell a force of 19,175 pounds. The cutting edges of the open clam already driven downwards by its own weight, are thus forced by this resource into the material and the resulting circular scooping movement adds the weight of the material gripped by the clam as a further force driving the edges down and into the material as the closing progresses.

Buffalo Frontier and Terminal Railroad.

Application has been made to the Railroad Commissioners of the State of New York by the Buffalo Frontier & Terminal Railroad Co., recently incorporated at Buffalo, for permission to build an outer belt line around the city of Buffalo, extending from Bay View on Lake Erie, a short distance south of the extensive plant of the Lackawanna Steel Works, to the Niagara river and the Erie canal at Tonawanda, a few miles north of the city. The total length of the line will be about 28 miles and it will cross and connect with all railroads entering Buffalo. It is the intention of the new company to build a breakwater and harbor with docks, elevators and warehouses at Bay View, and the total outlay in cost of construction of the railroad and terminal improvements will be between four and five million dollars. Work will be commenced as soon as authority is granted by the railroad commissioners. The incorporators include Frank H. Goodyear and Charles W. Goodyear, of the Buffalo & Susquehanna railroad, and the Buffalo & Susquehanna Iron Works; Daniel O'Day, Charles R. Huntley, Geo. S. Field, Arthur D. Bissell and E. C. Lufkin.

Creditors of the Morgantown Tin Plate Co., Morgantown, W. Va., have filed a petition in involuntary bankruptcy against the company. The plant was formerly known as that of the Rolling Mill Co. of America, and contains ten mills. It has never been completed and it is alleged by the creditors that it will cost about $50,000 to complete the same and place it in operation. The bonded indebtedness of the company amounts

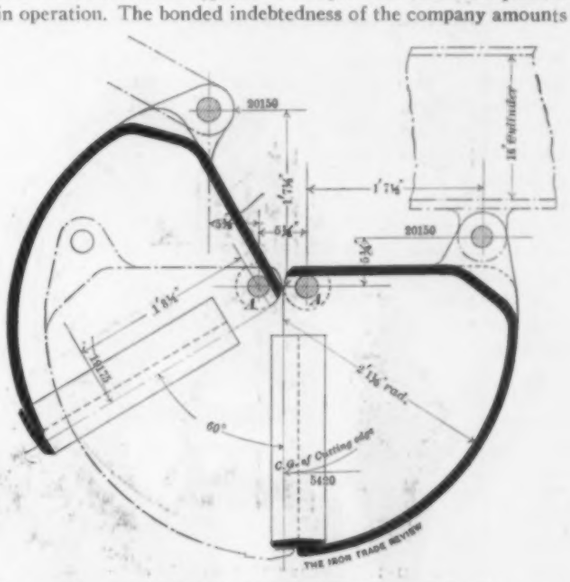


FIG. 2.—DIAGRAM OF PRESSURES ON CUTTING EDGES.

to $150,000 while the other liabilities amount to about $50,000. Among the largest creditors are the Canton Rolling Mill & Machine Co., the Corliss Engine Co., Dunbar Fire Brick Co., and the Northern Electrical Mfg. Co. Efforts to dispose of the plant to the American Sheet & Tin Plate Co. have proved futile. It is probable that local parties will attempt to finance the concern and hope to complete it in the near future.

The blast furnace in the State penitentiary at Rusk, Tex., which has been rebuilt, will be blown in within a few days.

IMPROVED PUNCH AND COPING MACHINE.

The accompanying cut represents an improved machine recently brought out by the Geo. Whiting Co., of Chicago, manufacturers of punches, shears and rolls, which is designed to

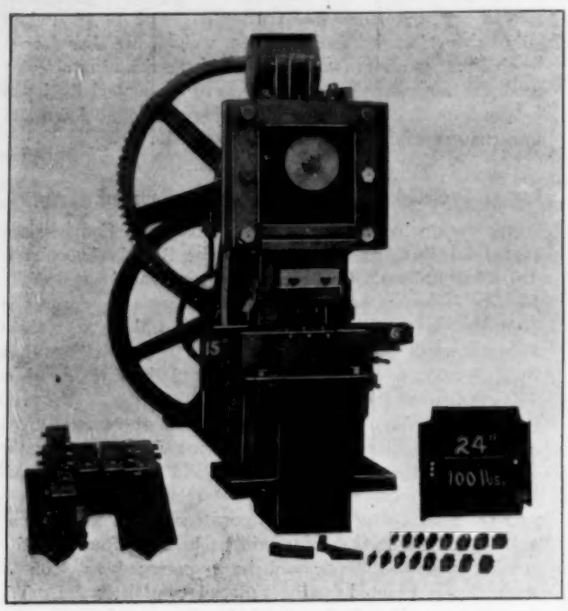


FIG. 1.—FRONT VIEW NEW PUNCH WITH COPING TOOLS AND SAMPLES OF WORK.

handle practically all the structural shapes rolled at the present time. The machine is built along the general lines of the Whiting punches, of which the folowing are some of the features embodied. The main frame or body is made of cast iron, with box section, made extra heavy with sides stiffened by means of heavy ties inside. The gearing has a large factor of safety and is carefully fitted to insure smooth running. The clutch jaws are fitted with heavy tempered tool steel plates on the faces. The crank shaft is forged from an open-hearth steel billet having proper physical qualities to withstand heavy duty and hard wear. The sliding head is made extra long and wide to safely withstand overhanging work and is fitted with a bronze gib for taking up any slight wear which may occur in time.

As will be seen in the illustrations, Figs. 1 and 2, the lower jaw is cored deep enough to allow a 24-inch I-beam to pass through and is of such form as to allow the various structural shapes to be worked on the tools furnished with the machine.

While the makers do not advocate the use of a machine fitted with a multiplicity of tools, yet it oftens occurs that concerns have not sufficient work to warrant the use of individual machines for different classes of structural work, and in designing the following attachments for above machine this fact was taken into consideration and tools were made to take in a greater range of material on this machine than can be worked on tools as commonly made.

The coping tools furnished with this machine are made to cope from 6 inches to 24 inches inclusive. This necessitates the use of two blocks in order to give proper clearance for the 6-inch beams, and also give proper strength under knives for coping 24-inch, 100-pound beams. The arrangement and manner of adjusting knives has been simplified, thus making it possible to keep the knives sharp and in good condition at much less expense and trouble than is common. The blocks and knives are perfectly interchangeable and best material is used in each case.

Flange punching tools are also provided for punching in flanges of beams or channels, two holes at one time or singly as desired. The blocks are double ended, taking 6-inch beams or channels on one end and 24-inch on the other end, as in Fig. 1. Bevel top dies are used, conforming to taper of flange. These dies are held in tool steel holders and adjustment of blocks is provided to suit gauges for different sections. Any class of flanged work can be punched on these tools, provided the leg does not exceed 24 inches in depth. Angles and Z-bars can also be readily punched in either leg.

Web punching tools are furnished, as illustrated in Fig. 2, suitable for punching in web of beams and channels, but plates, angles and Z-bars can also be punched on these tools. Punch and die holders are made of forged tool steel and are adjustable, ranging from 2-inch to 20-inch centers. The die holders are made extra high, so as to allow angles to be punched in either leg without turning around. Z-bars can be punched in same manner.

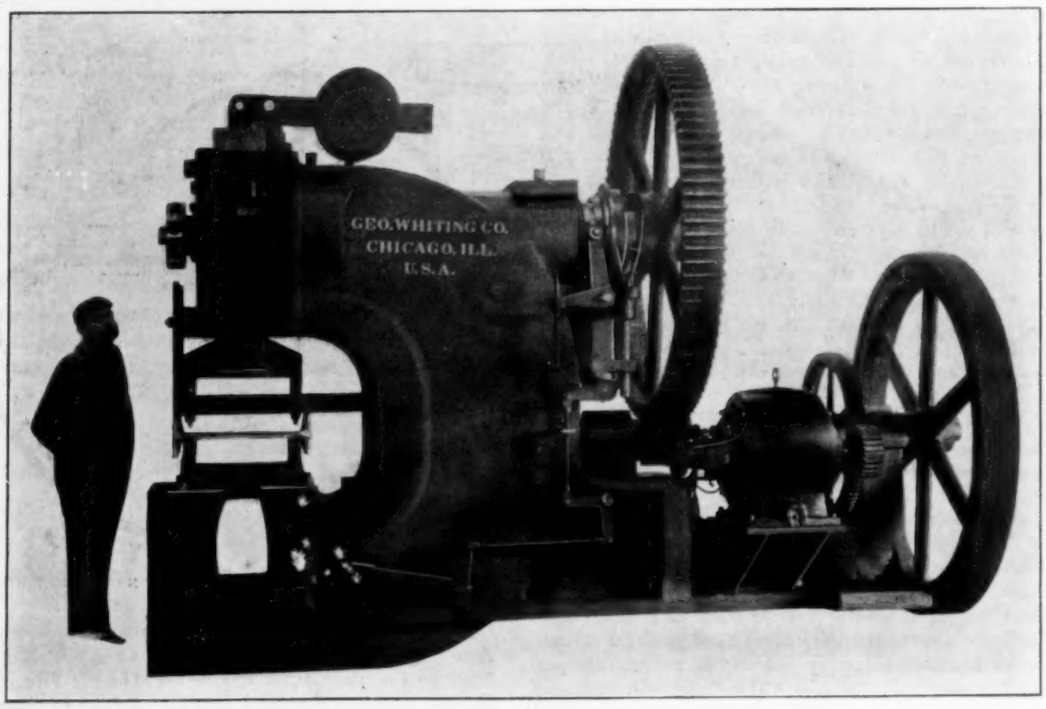


FIG. 2.—SIDE VIEW OF MACHINE WITH TOOLS SET FOR PUNCHING I-BEAM WEBS.

Washer punching tools are furnished, when desired, for making filler washers, one at each stroke of machine. These tools are arranged for making washers out of strips or scrap plate as desired. The punches are set tandem and the large

punch has taper tit of hardened tool steel, for centering large punch to small hole. Punch and die holders are made of tool steel and all parts are made amply heavy to do the work.

With the above attachments, the makers claim that they practically cover the whole range of structural work with this machine. Any of the above tools can be dispensed with, if desired, and the machine used as plain coper or punch.

Defects in Cast Iron, Their Causes and Remedies.*

BY HERBERT E. FIELD.

There is a familiar saying, "For every evil under the sun, there is a remedy or there is none." This applies very well to cast iron, as some of those properties of cast iron which we term defects cannot be wholly eliminated. They can be restrained and confined within narrow limits. I shall not bring before you any original discoveries of "patent" methods for eliminating defects. I shall place before you some material much of which may have been previously published. I was induced to choose this subject by continual complaints from foundrymen that it is impossible to distinguish what is true from what is also in the mass of contradictory literature which has been published in the last few years. It is almost impossible to find out just what you desire to know without going through a great volume of material which you do not want. The geologist, the botanist, and the physician all have material classified in such a manner that from certain characteristics and symptoms they can readily obtain the information of which they are in need. A foundryman may be troubled with excessive shrinkage in his iron. Somewhere, under some subject, in the material which he has so carefully collected there is without doubt a record of some one's experience on this point which would be of use to him. It is with the object of helping such a one at such a time that I am placing this material before you under separate headings. The scope of such a paper prevents anything like an elaborate discussion. It is hoped that it will be of some value until a more comprehensive classification can be compiled.

Shrinkage.

This is one defect in cast iron for which there is no complete remedy. We may cover our castings with risers and chills; we may fill them with nails, or leave them in the sand until stone cold, and still we will continually meet with this aggravating property in cast iron. In speaking of shrinkage I shall consider it as the decrease in the volume of the casting, requiring feeding, in contrast to true contraction. Shrinkage is, to be sure, an effect of contraction. As the lighter sections, or the outside surfaces of a casting, solidify and begin to contract, they draw away from the heavier parts of the casting which are still in a liquid or plastic state, and leave what is known in foundry parlance as a shrink. It has been known for a considerable time that cast iron expands in solidifying. This was proven by Thos. Wrightington, John Whitney, and Sir Lowthian Bell. Their experiments were confirmed by Thos. D. West who went still further and proved that hard iron expanded more in solidifying than soft iron. This expansion in the exterior dimensions of the casting would leave larger cavities in the center of the casting which would require feeding. When we consider that hard iron shrinks more than soft iron, and that hard iron expands more at the moment of solidification than soft iron, we can appreciate the value of Mr. West's experiments in aiding us to adopt methods for the prevention of shrinkage.

The form of shrinkage which causes us the most trouble is due to a thin portion of a casting solidifying and drawing away from a heavier portion. We are then at once confronted with two distinct reasons for shrink holes in castings. The first is mechanical, the second a physical or chemical. Under the former, we must take into account the design, the making of the pattern, and the gating and feeding. Under the latter we have to deal with the composition of the iron and the temperature at which it is poured. It should be remembered, as previously stated, that we can only hope to limit, or lessen shrinkage, and not to prevent it altogether. Hereafter "doing away with shrinkage," and like terms, will be used only in a comparative sense, meaning simply that the shrinkage has been reduced to the greatest possible degree, rather than that it has been entirely eliminated.

Shrinkage Due to Mechanical Causes.

Design.—The founder has enough to worry about without having to resort to all sorts of devices to remedy defects which should have been corrected before the work ever reached the foundry. This is especially true in the matter of the design. A course in foundry practice would be a very valuable addition to a draughtsman's experience. Great care should be exercised in the proper apportionment of metal in the designing of castings. The joining of thin and thick parts should be avoided whenever an interior shrinkage at such a point would be detrimental to the casting.

In hydraulic and similar castings, where internal shrinkage is liable to cause leaks, a special precaution should be taken to keep the thickness of metal as uniform as possible, and prevent this drawing away of light from heavy sections. When such work leaks, due to shrinkage, the leakage is invariably through the heavier sections. The light sections solidify first and draw away from the heavier parts which remain hot the longest, leaving shrink holes through which the water or steam is readily forced. This defect is even more prominent in castings where irons of high strength are used. Irons which give the highest strengths in large castings shrink the most. Just those castings which, on account of the work for which they are used should be the strongest, are the most liable to contain shrink holes. The lack of attention to this point on the part of designers has caused engineers to specify steel in many places where cast iron was formerly used.

The Pattern.—The next step after a correct design, is a correct pattern. The pattern should be so constructed as to make it possible to take care of the shrinkage in the important parts. It should be so made that shrink heads and risers can be placed on those parts of the casting which most need such protection. In considering whether a pattern should be made for molding on the end, or on the flat, this idea of so casting it that the shrinkage will be best taken care of should be constantly kept in mind.

Casting and Feeding.

When the pattern comes to the foundry there are several mechanical operations which may be used to obviate shrinkage. The first which occurs to your mind is the use of shrink heads and risers for feeding. There are many castings, however, which, from the use to which they are to be put, are so designed that a shrink hole in the center is not detrimental as long as it does not show on the outside. It is a waste of time and money to use large risers on such castings for the extra cost of iron used and the time lost in feeding and chipping is in many cases considerable. There are instances, too, where risers do more harm than good; in fact, they may create holes which would not have been there but for their presence. We have previously noted that most frequently shrinkage is due to the drawing away of the lighter part from the heavy part of a casting which has remained in the plastic condition for a much longer time. The practice of many molders is to place a large riser at this point, and keep the spot hot for a still longer time, thus giving a thin part a better chance to draw away and make a shrink. I well remember a badly designed gear blank which had caused trouble by shrinking away opposite the arms, and when teeth were cut holes showed up at the bottom of the teeth where each arm had solidified first and drawn away from the rim. The next day I noticed that a riser had been placed on each junction of the arm with the rim, and six molders were required to feed that gear. When it was cut, the holes were worse than ever. The cause for the defect had been aggravated rather than helped. The riser had tended to keep the iron at the junction of the arm and the rim hot for a still longer time, and had given a better opportunity for the arm to contract and draw away, thus leaving a bad shrink under each riser. Small so-called pencil risers on a large casting cause the same trouble by solidifying before the rest of the casting, frequently causing shrinks around the risers which

*Read before the New England Foundrymen's Association, Boston, Mass., March 9, 1904.

would not have been there had the risers been left off.

Risers are useful in preventing shrinkage only in so far as they are of sufficient size to be kept open until the part of the casting to be fed is practically solid. Otherwise, if the riser sets first it may draw away from the casting, leaving a hole under the riser which would at least have been out of sight had the riser been placed there.

We have noted that shrinkage was caused by expansion at the moment of solidification and that it was due to irregular cooling accompanied by differences in sections. These forms of shrinkage have been overecome to a certain extent by the use of chills. These in many cases act to prevent expansion and in others to make the heavier part cool at the same rate as the thin parts and thus prevent one drawing away from the other.

Shrinkage Due to Composition.

The element most liable to cause trouble in this direction is the carbon. High combined carbon causes high shrinkage. High graphitic irons are generally low shrinkage irons. High silicon tends to the formation of graphite, so in case of excessive shrinkage we should at once examine our iron for silicon and see if it is too low for the grade of work which we are making, and if it is, means should be taken to increase it. Should the silicon be all right, we should next look to our sulphur percentages. High sulphur tends to increase the expansion at the moment of solidification; it also tends to the production of combined carbon. High sulphur irons therefore are always high shrinkage irons. If the sulphur is found to be too high, we should first look for the source of the sulphur. It might be due to high sulphur coke, high sulphur pig iron, or high sulphur scrap. Having found the reason for the high sulphur, we can overcome it in several ways. The most satisfactory method is to eliminate the source entirely from the mixture. This would be possible if it were the pig iron and coke which were causing the trouble, provided they were bought on chemical specification as they should be. If they were not bought in this manner, the percentage of scrap could be decreased in order to reduce the sulphur; the percentage of silicon could be increased to overcome the hardening influences of the sulphur, or the percentage of manganese may be increased to neutralize the bad effects of the sulphur.

Should we find upon examination that our silicon was about right, and our sulphur not excessively high, we should next turn to the percent of total carbon. Shrinkage due to low total carbon is quite noticeable in castings the different parts of which vary to any great extent in thickness. It is a trouble which is more likely to visit those founders who are endeavoring to mix their iron by silicon and sulphur analysis, than it is those who are grading by fracture. The increase in use of extremely high silicon iron makes possible this form of shrinkage. High silicon irons, owing to the conditions prevailing in their manufacture at the blast furnace, are always low in carbon. If the carbon is found to be too low, there is but one remedy, that is, use higher carbon irons. There are a few furnaces that will sell pig iron with a guaranteed total carbon analysis, and there are others whose irons will run high in carbon, even if it is not so guaranteed.

The temperature of the blast furnace, the kinds of ore, the kind and amount of flux, and the amount of fuel used are all important factors in determining whether the pig iron which we buy will be high or low in total carbon. Generally speaking Alabama irons run fairly low in total carbon, while a majority of the northern irons, especially those using a large perponderance of Lake ores, run high in total carbon. There are many marked exceptions to this general classification.

The amount of carbon which an iron picks up or loses in passing through the cupola, has a decided effect upon the percentage of carbon in the casting, and hence upon the shrinkage. Irons melted in cupolas with low tuyeres, using a low proportion of fuel to iron, will pick up less carbon and hence have a greater tendency to shrink than would the same iron passing through a cupola with higher tuyeres using a larger proportion of fuel to iron. The blast also has considerable to do with the percentage of carbon lost. The higher the blast, the greater the amount of carbon burned off in passing the tuyeres. This is, however, somewhat balanced by extra absorption from the coke. The same iron melted in furnaces using greatly varying blast pressure will have a greater tendency to shrink when melted in the one having the higher pressure.

Hints on Prevention.

I have mentioned the increase of silicon as being one method for decreasing shrinkage. This should not be carried too far, however. If the silicon is increased to a sufficient amount to cause the carbon to drop, it becomes itself a cause for shrinkage. This drop in the total carbon, due to high silicon, arises from the fact that all high silicon irons are low in carbon and that high silicon irons always lose carbon in passing through the cupola. Shrinkage due to high silicon irons, low in carbon, is quite noticeable when the iron intended for light work is used in heavy castings, or in light casting which vary to any great extent in thickness. The shrinkage which is often seen in the center of a rectangular block, say 6" x 8" x 12", is very often due to low carbon, accompanied by high silicon, and can be entirely overcome by increasing the carbon and lowering the silicon. The drawing away around small gates, and the apparent sinking in of heavy parts of castings is very often attributable to this form of shrinkage.

Phosphorus is spoken of by many writers as a great panacea fore shrinkage. It often acts in an opposite manner, the action being, however, indirect. High phosphorus irons absorb less carbon in passing through the cupola than do low phosphorus irons. This reduction in carbon increases the shrinkage. The tendency of phosphorus to segregate in that portion of the casting which solidifies last keeps that part hot longer, and furnishes an opportunity for the portions already solidified to draw away from that part, leaving a shrink.

It is a difficult matter to give in exact figures the amounts of silicon, sulphur, phosphorus and carbon which are most advantageous in preventing shrinkage. This is so on account of the great number of different grades of cast iron which must be taken into consideration. Iron which will shrink excessively in one grade, may be all right for another. Light work of a uniform thickness can be made all right with a carbon down as low as 3 percent, with the silicon as high as 3 percent, and not show undue shrinkage. If this mixture were used in castings varying greatly in thickness, the shrinkage would very soon become apparent. Silicon, in soft iron work, should run from 1½ to 3 percent, depending upon the thickness of the castings to be made. For iron castings running under ¼ inch in thickness, 3 percent in silicon may be advantageously used. If we decrease the silicon .3 of 1 percent for every increase of 1" in thickness of the casting, we will probably approximate very closely to the maximum softness for that section. It should be understood that this applies to work where softness and low shrinkage are the chief considerations, and where strength does not form such an important item. If higher strengths are required, the silicon would have to be much lower. The carbon for a minimum shrinkage should not run below 3.4 percent, and in heavier work it might run higher to advantage. Sulphur should be limited to .08 percent in medium and light work, and to .12 in heavier work, unless special precaution is taken to counteract the hardening influence of the sulphur by an increase in the silicon or the manganese. Iron running as high as .16 in sulphur can be used satisfactorily in large castings providing the carbon, silicon and manganese are not too low.

In overcoming shrinkage then, the silicon should be kept from 1½ to 3 percent, depending upon the thickness of the casting. If the sulphur should run over .08 in light work, or .12 in heavy work, it should either be reduced, the silicon should be raised, or the manganese increased. If the carbon is below 3.40, it should be raised to above that point by the addition of high carbon irons. If the phosphorus is over .8, it should be reduced on account of its tendency to lower the total carbon. If the work is very heavy, the phosphorus can be advantageously kept below .5 percent.

Blow Holes.

Blow holes, as the term is used in foundry practice, include two kinds of cavities, first those formed by gas due to elements in the iron, second those caused by gas or moisture from the mold. The former are generally due to high sulphur uniting with oxygen and possibly with carbon. These gases are more injurious in light than in heavy work. In the latter, the iron remains hot for a sufficient length of time to allow

the gases to escape, while in the former, the rapid solidification of the iron prevents the escape of the gases. Dull iron is also favorable to the formation of such holes in castings for the same reason. The hotter the iron, the greater will be the opportunity for the gas to escape before the iron sets. Dull iron is caused by poor fuel, poor cupola practice, insufficient blast, etc. These same features are favorable to the absorption of sulphur from the fuel by the iron. There are two remedies for the presence of these gas holes due to sulphur. One is to eliminate the sulphur by removing the source from which it came, and the other is to increase the manganese which will form a sulphide of manganese which is not as harmful to the iron.

The second form of blow holes in castings is due to gases from the molds, and is caused by damp molds, too fine sand, too hard ramming, and insufficient venting. Here again dull iron increases the difficulty for the reason mentioned above, and small castings are more apt to suffer than large ones. The remedy for this form of blow holes is very simple. It is hot iron, dry molds, good sand, proper methods of ramming and venting. A careful study of the very valuable paper which Mr. West recently presented before your association would prevent the occurrence of many holes in castings which are frequently laid to the iron. Chemical analysis of the casting does not enable one to tell the temper of the sand into which the iron has been poured. When one or two castings taken from a heat of several hundred show blow holes, while the rest are perfectly sound, it is not difficult to conclude that the fault lies somewhere besides with the iron.

Cracks.

This defect in cast iron, although not as common as the first mentioned, is frequently quite as troublesome. Cracks due to the contraction of the iron in cooling after the casting has set are the most common. Here again design as well as composition must be considered. Insufficient attention paid to proportioning the metal will frequently set up strains in cooling which are not relieved until the casting is cooled and possibly not for weeks afterwards.

My own experience has been that the element which causes the greatest trouble along this line is high sulphur. The sulphure unites with the iron and forms a sulphide of iron which surrounds the crystals of iron in small microscopic cracks. This sulphide renders the iron red short; it melts at a bright red heat, long before the rest of the iron melts. When the iron cools, the opposite occurs. The iron sets before the intermingled sulphide, which remains liquid until after it reaches the temperature of about 900 deg. C. When the sulphide solidifies and cools it contracts and leaves small crevices which are visible as cracks only under the microscope. These cracks render iron high in sulphur very short, and unable to withstand shrinkage strains. The best remedy is to reduce the sulphur; the next best is to increase the manganese. Manganese and sulphur unite to form a compound which segregates at higher temperatures and forms into small globules. These globules do not in any way improve the iron; they are, however, much less harmful than the microscopic cracks caused by the sulphide of iron.

Phosphorus is also a very harmful element in causing cracks in castings. Some time ago I was called to a foundry that was having a great deal of trouble with some thin cylinder castings which they had been making for years without trouble. All at once these castings began to crack badly. Some would crack the day after casting, others weeks after while being machined, and still others some months after while the castings were in use. This caused a great deal of trouble and expense. At first sight I was inclined to lay the defect to high sulphur, but upon analyzing the castings I found that the sulphur was below normal, but that the phosphorus ran very high; in some cases it was over 1 percent. I suggested reducing the phosphorus by the use of some low-phosphorus iron, and the trouble immediately ceased. It appeared about a year later and the analysis again showed high phosphorus and low sulphur. When the phosphorus was reduced, the trouble again disappeared. The only way to reduce this injurious effect of high phosphorus is to reduce the phosphorus itself, and this can only be done in cupola practice by the use of low-phosphorus pig iron.

Irons low in carbon, say below 3 percent, and high in silicon, occasionally show this same tendency to crack. This, however, is an unusual composition and requires but brief mention in passing.

Whenever there is a question as to whether the design of the casting or the composition of the iron is at fault, it will generally be found to be more economical to first change the design. The low contraction irons, that is, those low in phosphorus and sulphur, and almost always the highest in price. It is always advantageous to have a small amount of very low sulphur and low phosphorus iron on hand for use in emergencies.

There is a second form of cracking which is frequently confused with contraction cracks. This might be called a shrinkage crack. A high shrinkage iron will frequently solidify on the outside of the casting and appear sound when the inside may have shrunk away leaving a comparatively thin shell. When contraction sets in, this shell is not able to withstand the strain, and cracks. The reason and remedy for this were considered under "shrinkage."

Cold Shut.

Cold shuts may be due to one of two causes: First, to the iron not being hot enough, and second, because the iron is not of the right composition. Dull iron is due to poor cupola practice and it is not always the founder who uses the most fuel who has the hottest iron. The size and arrangement of the tuyeres, proper methods of charging, correct volume and pressure of blast, all enter in to produce hot iron.

Some irons which are apparently hot as they leave the cupola do not retain their heat. High-sulphur and low-phosphorus irons are especially liable to act in this manner. The remedy for dull iron, which is the same as the remedy for cold shuts, is to improve the cupola practice on the one hand, and to use low-sulphur and high-phosphorus irons on the other. High-phosphorus irons are especially valuable in this direction. They should not, however, be used to excess on account of their tendency to make iron weak and to reduce the carbon. High phosphorus is a great help in light intricate work but it may be a great curse in heavy work.

Weakness.

We will consider three separate forms of weakness in iron under this heading. First, the tendency of castings to be "brittle" or "short," second the lack of strength shown in many soft irons, and third the lack of strength exhibited by many of the so-called strong irons.

We call an iron "cold short" when it breaks under shocks and has no elasticity. Most founders grading by fracture occasionally run into this difficulty. It is first noticed when castings break in the rattler, and when gates break into the castings while they are being chipped off. It may be attributed to either one of two causes, high sulphur, or too high phosphorus. The castings should be at once examined for these elements, and when it is determined which is at fault, the coke and pig iron should be analyzed and the defective material eliminated or counteracted as explained under previous heading.

The second form of weakness, due to the iron being too soft, may not be noticed unless the castings are subjected to some unusual strain. Too high silicon combined with too high carbon is generally the cause of this defect. It can best be remedied by reducing the silicon. Many founders go to the opposite extreme, however, and sacrifice good qualities in their castings for the sake of an imaginary hundred pounds extra transverse strength in a test bar which in no way represents the actual iron in the casting.

In considering the third condition, it should be remembered that high strength irons are usually high shrinkage irons, and that when a casting is to be subjected to any unusual strain, it should be so designed and the pattern so constructed that this extra shrinkage can be taken care of. High silicon, high carbon, high sulphur, and low manganese tend to weaken iron. Low silicon, low sulphur, low phosphorus and high manganese tend to increase the strength of iron. I do not mean to say that an addition of sulphur to iron would always weaken it; very soft iron may be strengthened by increasing the sulphur. This is not an advisable method, however. For an excess of sulphur causes the iron to be short and hard.

Theoretically every different thickness of casting should have

a different composition in order to give that section the maximum strength. It is impossible to obtain castings of 1-inch section and 6-inch section out of the same ladle and have them both equally strong. The composition of castings from 2 to 4 inches in thickness should run between 1 percent and 1.60 percent in silicon, from 2.20 to 2.80 percent in carbon, under .45 percent in phosphorus, under .10 percent in sulphur, and between .5 and 1 percent in manganese in order to give the maximum strength in that section. Sections running under 2 inches in thickness should have the silicon increased and the other elements kept constant, or the carbon increased and the silicon kept constant. High tensile tests have been obtained from test bars fairly high in carbon, but in order to obtain a casting which shall be uniform in strength throughout its section, the carbon should be kept low, as specified above.

There are two methods of obtaining strong iron castings, one is to buy pig iron which the makers will guarantee to give the desired strength. The other is to select by chemical analysis those irons which when mixed together will give the required composition for high strength. In the latter method more or less steel is generally necessary to bring the carbon down to the required amount. The indiscriminate use of steel without the aid of chemical analysis is not to be recommended as it frequently leads into difficulties which are at least very expensive.

Dirt.

We often hear iron spoken of as "dirty iron." This is a very misleading term and one difficult to explain. Dirt in cast iron is due to three causes, slag from the cupola, sand from the mold, and impurities in the iron.

The first is wholly inexcusable as proper precautions taken in pouring, skimming, and gating will entirely prevent its presence in the mold. My opinion was recently asked in regard to the quality of a certain iron. The portion examined showed small particles of slag imbedded in the casting. The analysis was all right and I suggested that the slag came into the casting with the iron. Pencil gates were tried and the trouble immediately disappeared. Too little care is exercised in this respect, and too much stress is placed upon the fact that slag is lighter than iron and will consequently float on the top of the runner. This is no doubt true where the gates are small and where the runner is kept full. When castings are poured with large gates and the iron is rushed into the mold, the swirl of the iron through the gates is sufficient to carry slag in with the iron, even if the runner is kept full, which I am sorry to say, is not always the case.

Dirt in the casting due to scabbing of the mold or breaking of the core is easily traced from the fact that the sand found in the casting will generally indicate from whence the dirt came. There is but one remedy for such defects, viz., to use all the precautions in tempering the sand, venting, ramming, and gating, as was discussed under blow holes.

Dirt from impurities in the iron is not as easily remedied. Hot iron will hold more impurities in solution than cold iron. As the iron cools the carbon will separate in the form of "kish." This can frequently be seen flying from the top of the ladle at blast furnaces. In cupola iron it generally rises to the top of the ladle or of the casting as it cools down from the high to low temperature. This separation is more noticeable in irons high in silicon and carbon and low in sulphur phosphorus and manganese. This may be remedied by lowering the silicon and carbon, first by using irons lower in these elements; second, by the addition of scrap, and third, by the use of steel, or turnings. Irons which tend to act in this manner are generally good scrap carriers, and are most valuable where scrap is low in price.

There is a sulphide of manganese which sometimes separates out of the casting and rises to the top. In one instance to my knowledge, this caused a great deal of annoyance and expense. The iron was high in phosphorus and remained fluid for a long time. The sulphide of manganese, as it rose to the top, segregated in small spots which greatly injured the appearance of the casting when it was machined.

Hardness.

Hard castings are due to two causes, first, hard pig or scrap iron, and, second, poor coke. If you are buying by fracture your pig iron agent lays your hard castings to the coke, while the coke man is sure it is the pig iron. Low silicon, low carbon, high sulphur and high manganese are the four conditions in the composition of cast iron which tend to make it hard. The percentage of silicon and manganese in a casting is determined by the amount of these elements in the iron charged into the cupola. The percentage of sulphur in the resultant casting is dependent upon the percentage of sulphur in the coke used as well as upon the percentage in the irons.

Cast iron upon which there is much machine work should be as soft as possible and still be strong enough for the purposes for which the casting is to be used. It would be impossible in this paper to define the percentages of silicon which would accomplish this in all grades of work. Each founder should determine this for his particular grade of work, and if his castings should show a tendency to be hard, he should have them analyzed and see if the silicon is up to that amount. Sulphur should next be tested for, and if it is found excessive, it should be reduced or counteracted as explained earlier in the paper. Every foundryman should keep on hand a small amount of high silicon iron for just such emergencies. It will, however, be found more economical to use irons which approximate in silicon to the required amount than to use high silicon pig. The amount of silicon required to give a specified softness in a given section depends upon the percentage of carbon, sulphur and manganese present. The higher the total carbon, the less silicon will be required. The higher the sulphur and manganese, the higher will be the silicon necessary to give the desired softness.

Before leaving this subject I will refer to a slight defect which frequently causes considerable trouble in machining, viz., the appearance of hard spots or shot imbedded in a soft casting. This is generally ascribed to small pieces of iron which have come through the cupola unmelted. I have analyzed many of these shot, and found that this is not the case. They are due to small spatterings of iron formed when the hot iron strikes the mold. They chill in small round pieces and are not remelted by the iron in the mold. These shot generally accompany cold shuts and blow holes. The latter, it will be remembered, are generally caused by cold iron. When the iron is very hot, even if shot are formed, they would be remelted. The only difference which those shot show, by analysis, from the rest of the casting is a higher combined carbon, due to the quick chilling.

There are several other minor defects which might be included in this paper, but it has already gone beyond the scope intended. I trust, as stated in the introduction, that it will be considered only as the beginning of a classification which will be of general use to foundries in remedying those defects which are bound to occur in cast iron.

Castings for Pennsylvania R. R. Tunnels.

The Pennsylvania Railroad Co. has awarded the contract for the construction of two North River tunnels between the Manhattan shaft near 11th avenue and the Weehawken shaft on the Jersey shore to the O'Rourke Engineering & Construction Co., of New York. The contract for the four East River tunnels between the First avenue shaft, New York, and a point in Long Island City, has been awarded to F. Pearson & Son, Ltd., of London. This company probably has had more extended experience in subaqueous work than any other contractor, notably Black-Wall tunnel under the Thames in London. It has recently finished the great North City tube lines in London and is carrying out the heavy harbor improvement work at Dover, England. Carr Bros., of No. 61 Broadway, New York, are the agents in this country for F. Pearson & Son. The O'Rourke company is capitalized at $1,000,000. It is a well-known company of contractors and builders.

These general contractors will award sub-contracts for parts of the work and a number of foundries are figuring on furnishing castings. It is said that various pig iron firms have had inquiries for prices from foundries intending to bid. The O'Rourke Engineering Co. also has been making inquiry concerning pig iron prices, but rather as a gauge on the bids it will receive from foundries. The coke supply is also being figured on. The castings required will aggregate fully 240,000 tons, and as high as 300,000 tons has been talked of, the deliveries being distributed over three years.

PIG IRON PRODUCTION BY GRADES IN 1902 AND 1903.

Prior to 1900 detailed statistics of the production of all leading grades of pig iron were not collected by the American Iron and Steel Association, but for 1900 and 1901 full and complete reports were received from all manufacturers and printed in the annual statistical report of the association for the year last named. In the tables which follow the production of pig iron in the United States by grades is given for 1902 and 1903. A few thousand tons of castings direct from the furnace are included in the totals for white and mottled and miscellaneous grades of pig iron for each year. High silicon pig iron is included in the foundry figures.

The Bessemer figures include low-phosphorous pig iron, that is, iron running below 0.04 percent in phosphorus. Iron containing from 0.04 to 0.10 percent of phosphorus is classified as Bessemer. The basic figures are confined strictly to pig iron made with mineral fuel, and do not include the small quantity of basic iron that is annually made with charcoal, practically all of which is used by manufacturers of steel castings.

The following table gives by grades the total production of pig iron in the United States in 1902 and 1903, in gross tons of 2,240 pounds:

Grades—Gross tons.	1902.	1903.
Bessemer and low phosphorus pig iron	10,393,168	9,989,908
Basic pig iron made with min. fuel	2,038,590	2,040,726
Forge pig iron	833,093	783,016
Foundry and high silicon pig iron	3,851,276	4,409,023
Malleable Bessemer pig iron	311,458	473,781
White and mot. and other grades	180,741	120,137
Spiegeleisen	168,408	156,700
Ferro-manganese	44,573	35,961
Total	17,821,307	18,009,252

Of the total production of pig iron in 1903 over 55.4 percent was Bessemer and low-phosphorus, as compared with over 58 percent in 1902; 24.4 percent was foundry, against 21.6 percent in 1902; over 11 percent was basic, against about 11 percent in 1902; 4.3 percent was forge, against 4.6 percent in 1902; over 1 percent was spiegeleisen and ferro-manganese, against 1.19 percent in 1902; and 2.6 percent was malleable Bessemer, against 1.7 percent in 1902. The production of white and mottled and miscellaneous grades of pig iron and of castings made direct from the furnace amounted to a little over 1 percent in 1902 and to less than 1 percent in 1903.

In 1903 the production of low-phosphorus pig iron, which is chiefly used by manufacturers of acid open-hearth steel, amounted to 200,422 tons, against 164,246 tons in 1902. In 1903 it was made by four States, namely, New York, Pennsylvania, Tennessee, and Ohio. In 1902 all the States named made low-phosphorus iron except Ohio. New Jersey, which made low-phosphorus iron in 1902, did not report any for 1903.

The following table gives the production by States of Bessemer and low-phosphorous and basic pig iron in 1902 and 1903 The small quantity of charcoal basic pig iron is not included:

States—Gross tons.	Bess. and low-phos. 1902.	Bess. and low-phos. 1903.	Basic. 1902.	Basic. 1903.
New York	60,818	129,323	15,766	34,516
New Jersey	5,863	.....	74,970	83,286
Pennsylvania	5,130,022	5,213,143	1,528,748	1,417,253
Maryland	296,971	321,784	.....	.....
Virginia	.....	1,000	95,776	90,543
West Va.	182,937	198,688	.....	.....
Tennessee	9,746	26,856	.....	5,176
Alabama	.....	2,299	199,415	172,280
Ohio	2,927,605	2,422,676	101,457	190,840
Illinois	1,495,298	1,386,683	.....	.....
Michigan	926	3,520	.....	.....
Wisconsin	70,303	74,080	.....	.....
Minnesota	70,303	33,740	.....	.....
Missouri	.....	.....	22,458	17,000
Colorado	201,580	176,116	.....	29,832
Total	10,393,168	9,989,908	2,038,590	2,040,726

The production of foundry and forge pig iron by States in 1902 and 1903 was as follows:

States—Gross tons.	Foundry. 1902.	Foundry. 1903.	Forge. 1902.	Forge. 1903.
Mass.	3,360	3,265	.....	.....
Connecticut	12,086	14,501	.....	.....
New York	272,633	304,667	45,887	37,986
New Jersey	59,015	85,257	32,234	25,750
Pennsylvania	845,472	948,957	399,962	433,925
Maryland	3,789	2,460	1,939	326
Virginia	348,771	413,403	59,402	29,551
West Va.	68	43	.....	.....
Kentucky	93,699	98,600	15,381	2,453
Tennessee	328,975	350,966	41,137	23,159
North Car.	544	6,779	71	619
Georgia	30,762	59,910	.....	5,765
Texas	3,095	11,408	.....	.....
Alabama	1,044,874	1,194,556	170,784	155,937
Ohio	403,880	416,850	52,418	61,904
Illinois	67,627	115,223	2,649	5,641
Michigan	154,234	239,369	.....	.....
Wisconsin	152,965	112,656	.....	.....
Mo., Col. and Wash.	25,427	30,153	11,229	.....
Total	3,851,276	4,409,023	833,093	783,016

Included in the 4,409,023 tons of foundry iron made in 1903 are 51,516 tons of ferro-silicon, produced in Virginia, Kentucky, Tennessee, Georgia, and Ohio, a small part of which was made with electricity. For 1902 ferro-silicon was not separately collected. Pig iron containing 7 percent of silicon and over is classified as ferro-silicon.

The production of malleable Bessemer and of white and mottled and miscellaneous grades of pig iron in 1902 and 1903 is given in the following table. Castings made direct from the furnace are included with white and mottled iron:

States—Gross tons.	Malleable Bessemer. 1902.	Malleable Bessemer. 1903.	White and Mottled and Miscellaneous. 1902.	White and Mottled and Miscellaneous. 1903.
New York	.....	44,951	6,265	1,474
New Jersey	2,748	.....	2,368	2,028
Pennsylvania	7,693	41,790	62,067	45,068
Maryland	.....	.....	530	.....
Virginia	500	.....	32,767	9,537
West Virginia	.....	.....	.....	282
Kentucky	.....	.....	1,645	1,388
Tennessee	.....	.....	12,920	12,211
North Carolina	.....	.....	15	125
Georgia	.....	.....	923	2,403
Texas	.....	.....	.....	245
Alabama	.....	.....	56,543	35,212
Ohio	144,629	188,173	1,399	6,991
Illinois	118,805	126,873	40	.....
Michigan	.....	.....	53	1,820
Wisconsin	37,083	61,688	2,537	1,352
Mo. and Wash.	.....	10,306	609	.....
Total	311,458	473,781	180,741	120,137

The production by States in 1902 and 1903 of spiegeleisen and ferro-manganese was as follows:

States—Gross tons.	Spiegeleisen. 1902.	Spiegeleisen. 1903.	Ferro manganese. 1902.	Ferro manganese. 1903.
New Jersey	14,182	15,346	.....	.....
Pennsylvania	99,383	76,493	44,453	34,871
Alabama	475	24	120	1,090
Illinois	45,801	57,955	.....	.....
Colorado	8,567	6,882	.....	.....
Total	168,408	156,700	44,573	35,961

The figures given for ferro-manganese for 1902 include a small quantity of ferro-phosphorous made in one of the Southern States. Ferro-phosphorus was not reported to us for 1903.—[Bulletin of American Iron and Steel Association.

Frank B. Bigelow, a stockholder in the National Steel and Wire Co., and representing other minority stockholders, has brought an action in the Supreme Court of New York to prevent the consolidation of that company with the Safety Insulated Wire & Cable Co., under a new company to be known as the Atlantic Steel & Wire Co. He claims that the defendants would realize a profit of $1,500,000, which the plaintiffs would lose. The claim is also made that the stocks and bonds of the Safety Insulated Wire & Cable Co. are of little or no value.

The work of construction has just been finished on the first blast furnace in Pretoria, South Africa. The furnace will have a weekly capacity of 500 tons of pig iron and is to be followed by the building of rolling mills and a steel plant. The ore found near the site of the blast furnace is said to run from 58 to 62 percent iron.

E. R. Durham, United States Marshal, has been appointed receiver of the Swearingen Shutter & Iron Works Co., Kansas City, Mo. The property will be sold.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Recording & Computing Machines Co., Dayton, O., has been incorporated with a capital of $300,000. Incorporators are: Will I. Ohmer, J. M. Crawford, Fred W. Tobey, C. H. M. Atkins, William Christie Herron and A. W. Williamson.

A company has been organized at Petersburg, Ind., to manufacture galvanized iron and metal roofing, guttering, cornices and other kinds of tin and iron work. The company will be capitalized at $10,000. The members of the company are George M. Bohnert, William A. Braden, W. E. Williams and John H. Viehe.

The Holden Mfg. Co., Chicago., has been incorporated with a capital of $2,500 to manufacture machinery.

The Wood Railway Signal Co., Fostoria, O., has been incorporated with a capital of $15,000. Incorporators are: Oscar Wood, G. G. Grimes, T. D. Adams, A. J. Stackhouse and J. H. Jones.

The National Automatic Tool Co., Dayton, O., has been incorporated with a capital of $200,000. Incorporators are: E. A. Schaeffer, Fred J. Nutting, John J. Schaeffer, Robert A. Carney and William F. Bockhoff.

A. Schrader's Son Co., New York City, has been incorporated with a capital of $400,000 to manufacture machinery, tools, etc. Incorporators are: C. K. Cole, New York City; H. P. Kraft, Brooklyn; M. C. Schweinert, Hoboken, N. J.

The Charlotte Pipe & Foundry Co., Charlotte, N. C., is in the market for a second-hand lathe which swings from 3 to 4 inches and which will take from 16 to 20 inches between centers.

The New York Scale Co., New York, has been incorporated with a capital of $200,000. The company will manufacture scales, slot machines, etc. Incorporators are: Louis D. Weldman, 60 West 129th street; William H. Pritchard, 135 East 44th street, and Frank Fowler, 135 East 44th street, all of New York City.

The Rock River Mfg. Co., Dixon, Ill., has been incorporated with a capital of $40,000, to engage in manufacturing and foundry business. Incorporators are: John B. Lott, Fred N. Fargo and Zachariah W. Moss.

The Chase Smokeless Furnace Co., Salt Lake City, Utah, has been incorporated with a capital of $100,000. The company will manufacture the Chase incandescent smokeless furnace. The officers are: Simon Bamberger, president; E. S. Chase, vice president, and R. C. Hawley, secretary and treasurer.

The Genesee Auto-Car Co., Rochester, N. Y., has been incorporated with a capital of $10,000 to manufacture motors, etc. Incorporators are: Edward A. Keenan, George W. Hason and Henry H. Kingston.

Application has been made for the incorporation of the Stanton Foundry & Machinery Co., Palatka, Fla. The company will manufacture and repair castings, machinery, boilers, gas and gasoline engines, etc. The capital stock will be $15,000. The temporary officers are: Christopher Stanton, president; E. N. McNabb, vice president; H. M. DeMontmollin, secretary and treasurer.

The Universal Rotary Motor Co., New York, has been incorporated with a capital of $250,000 to manufacture motors. Incorporators are: Leopold J. Lippmann, Theodore K. Wegman and Nathan Kronman.

The Wilson Positive Blower Co., New York, has been incorporated with a capital of $50,000 to manufacture blowers.

George Edward Adams, James Francis Howe, and Charles Burnett Jr., have purchased the plant of the Bay City Iron Works, Bellingham, Wash., and have formed a corporation known as the Industrial Iron Works. The capitalization of the new concern is $25,000. The plant will be enlarged and the company will manufacture and repair locomotives, general machinery, boilers and electrical machinery.

At the office of the supervising architect, Washington, D. C., sealed proposals will be received until 3 p. m., March 23, for the installation of two hydraulic lifts in the postoffice at Butte, Mont.

John G. Duncan Co., P. O. Box 543, Knoxville, Tenn., wants dealers' prices on one 24 x 12 to 10-foot bed-iron lathe, one 24 to 32 drill press, one 20 to 24 shaper, and one five-foot planer, all second-hand.

Asheboro Wheelbarrow Co., Asheboro, N. C., will buy combined punch and shear with power to punch and cut ⅜ to 1½-inch steel tire and to cut ⅜-inch rod iron.

J. F. W. Dorman Co., 216 East Lexington street, Baltimore, Md., will buy lathes, drills, drop hammers, milling machines, routing machines, etc., but will not be ready to receive machinery for about four weeks.

Rennous, Kleinie & Co., Hazazers' Hall, 111 Franklin street, Baltimore, Md., ask prices on three lathes, one planer, one small drilling machine and one emery wheel for grinding tools, etc.

The Inland Novelty Iron Works, Indianapolis, capital stock $5,000, has been incorporated. Chas. A. Bookwalter, D. V. Reedy, H. P. Brumbaugh, incorporators.

O. C. Kilgour, 415 B street, S. E., Washington, D. C., will be in need of 24-inch lathe, 12 or 14-inch lathe, 10-inch and 24 to 30-inch drill press, 16 to 20-inch shaper, universal milling machine, gasoline engine, 10-h. p. back saw and small tools and supplies.

Charlotte Pipe & Foundry Co., Charlotte, N. C., is in the market for second-hand lathe with swing from 3′ to 4′ and which will take from 16′ to 20′ between centers.

Harper Machinery Co., Park Row building, New York, is in market for second-hand Corliss slow-speed engine, 500 h. p.

Anthracite Machinery Co., Allentown Pa., wants to buy second-hand, two each, 20, 25, 30, 40 and 45-h. p. automatic engines and one 60-h. p. boiler.

New Construction:—

General Manager M. J. Carpenter, of the Pere Marquette railroad, announces that this year the company will erect in Grand Rapids, Mich., a large roundhouse, and will start other work which will eventually mean the building of extensive car shops.

Williamson Bros. & Co. will build a large addition to their foundry at Thirteenth and Hamilton streets, Philadelphia.

The plant, heretofore mentioned, which the American Radiator Co. will erect at Litchfield, Ill., will consist of the following buildings: Two foundries, 90 x 425 ft. each; coreroom and ovens, 90 x 125 ft.; machine shop, 90 x 160 ft.; storage and warehouse, 120 x 320 ft.; offices, 30 x 80 ft., and a power plant, 40 x 120 ft. The cost of construction without equipment will be about $200,000.

The National Carbon Co. contemplates expending $200,000 this year in the construction of a new plant. The company's present plant is in Cleveland, but it is understood that the new plant will be erected elsewhere, probably in Chicago.

The Fisher-Elliott Book Typewriter Co., which now has plants in Cleveland, O., and Harrisburg, Pa., has under consideration plans for consolidating the two plants and is looking for a location. The city of Elyria, O., has made the company a proposition to induce it to build the new plant in Elyria.

The National Electric Co., Milwaukee, successor to the Christensen Engineering Co., manufacturer of air brake and electrical machinery, has just moved its executive offices and engineering department to its new building located at the works. The building is constructed of cement blocks 2 ft. long x 1 ft. high, and is 200 ft. long x 66½ ft. wide. Extensions and improvements are also being made in the shops to supply the necessary facilities for handling the company's constantly growing business.

The Hoyt Metal Co., St. Louis, whose plant was recently partly destroyed, has rebuilt the burned rolling mill building, and resumed operations in that department March 15. The company expects to move into new quarters at Granite City, Ill., about May 1.

The Spacke Machine Co., Indianapolis, has just purchased a tract of ground just north of its present building, upon which it expects to erect a steel frame machine shop building, having a frontage of about 80 feet and running through from Madison avenue to Pennsylvania street. Later on the com-

pany may erect a foundry building. The company cannot now give exact date of commencing building operations.

The Muncey Electric Co., Bay City, Mich., has recently established a machine shop.

The Michigan Brass & Iron Works, Detroit, will build a new core shop which will be equipped with the most improved machinery.

Plans and estimates for improvements to the Big Four shops at Mattoon, Ill., aggregating a cost of $150,000, are now in the hands of Superintendent of Motive Power Garstang in his office in Indianapolis. It is expected that the improvements will be made during the coming summer.

The cost of new construction and equipment for the Pennsylvania lines east of Pittsburg and Erie for the year 1904 will amount to about $21,000,000. This will complete all the work now under way, amounting to about $15,000,000, and the new work authorized at the last meeting. President Cassatt announces that the company has contracted for the North and East river tunnels and will proceed with the construction of the New York station. The remainder of the work in that locality will not be placed under contract for perhaps a year. The cost of completing the construction and equipment work now under way and the new work authorized for the lines west of Pittsburg will amount to about $10,000,000.

The Erie City Iron Works, Erie, Pa., are planning to build an extensive addition to the present plant.

The Twentieth Century Heating & Ventilating Co., Akron, O., will build an addition which will almost double the capacity of the plant. About 75 additional men will be employed in the foundry and machine shops.

A. M. Sanders & Sons, of Reedsburg, Wis., are planning to add a foundry to their shop at some time in the spring.

The Hilles & Jones Co., Wilmington, Del., will erect a foundry building 123 by 200 feet. The foundation will be of concrete and the upper portion of the structure of glass and iron.

The rebuilding of the plant of the Johnson Forge Co., Wilmington, Del., recently burned, has been begun. The plant will consist of one building 70 x 192 ft. and several smaller structures.

The contract for the foundry to be built in connection with the Burns Boiler Co.'s plant at DePere, Wis., has been let. The new foundry will be 56 x 150 ft., built of brick. Modern equipment will be installed.

Contracts have been awarded for the erection of additional buildings at the shops of the Southern railway at Spencer, N. C. Work will begin as soon as the weather will permit, and about one year will be required to complete the improvements, which will cost approximately $483,000, including the necessary machinery and equipment.

The Champion Blower & Forge Co., of Lancaster, Pa., has purchased three acres upon which it will build a new foundry.

The site of the engine plant and machine shop, of the Harrison Machine Works, Belleville, Ill., has been disposed of and the company expects to erect a new machine shop and engine department on the same tract of land now occupied in part by its foundry, wood-working shop and other buildings. This will group the buildings, and result in a more economical operation of the plant than has been possible in the past. The proposed new machine shop will be about 200 feet in length by 50 feet wide, with a two-story L, 100 x 50. It will have a capacity of 150 to 200 traction engines per year. Practically all of the present equipment of tools and machinery will be installed, and the company does not expect that it will require much new machinery.

The Pittsburg and Valley Districts:—

One of the plants of the Standard Chain Co., of Pittsburg, located at Carlisle, Pa., was destroyed by fire last week; loss, $10,000.

The offices of the Oliver & Snyder Steel Co., Frick building, Pittsburg, will be removed to South Tenth and Muriel streets, Pittsburg, on April 1.

The Youngstown, O., plant of the American Bridge Co. has been shut down and will be dismantled as speedily as possible. All the machinery is to be removed to Ambridge, Pa., where the company's large new plant is located.

Five of the mills of the Ætna-Standard plant of the American Sheet & Tin Plate Co., Bridgeport, O., are in operation. The remaining 23 mills are idle and from present indications will remain idle for some time as the sheet workers have refused to take a reduction of 10 percent offered them.

The Howe Scale Co., Pittsburg, will move April 1 to its new and more spacious quarters, 114 Market street.

The American Ingot Mold Co., of Pittsburg, was granted permission last week to bring action in assumpsit against the Clairton Steel Co., on a debt of $51,000, in the case of the Crucible Steel Co. of America against the Clairton Steel Co. The Mesta Machine Co. was granted leave to issue scire facias on its mechanics' liens and proceed to judgment.

Pittsburg members of the American Society of Mechanical Engineers have organized for the purpose of entertaining the members of the British Society of Mechanical Engineers who will meet with the A. S. M. E. in Chicago in May. H. F. J. Porter has been elected president of the organization, Emmanuel Kaufman secretary, and H. A. Porterfield treasurer. Headquarters have been established in the Westinghouse building.

The plant of the Hapard Foundry & Machine Co., Monongahela, Pa., was sold last week to a new company composed of W. T. Albert, David Gregg and Harry Hayward. The plant is to be enlarged and will be placed in operation shortly.

Howard M. Hooker & Co., Pittsburg, have commenced suit against the Kelly & Jones Co., of the same place, to collect $2,698.75 claimed on a coke contract. On Dec. 9, 1892, it is alleged a contract was entered into with the Kelly & Jones Co. whereby Howard M. Hooker & Co. were to deliver 208 cars of coke at $4.90 a ton at the ovens, and after 161 cars had been shipped it is charged that the Kelly & Jones Co. refusd to take any more cars on the contract. Kooker & Co. state that they sold the remaining 47 cars at the best market price obtainable, or $2.24 a ton, and suit has been commenced to collect the difference between the market price and the contract price.

The first annual meeting of the Seger Coal & Coke Co., of Pittsburg, was held last week. Work on two coal tipples with a daily capacity of 200 tons each is progressing rapidly near Ligonier, Pa., and contracts have already been awarded for the erection of a coke plant consisting of 200 ovens. Samuel Seger was elected president; W. E. McMillen, vice president; John D. Seger, treasurer; R. D. W. Bruner, secretary, and W. G. Cronkright, general manager.

The plant of the West Virginia Steel Co., Wheeling, W. Va., was sold last week at trustee's sale for $39,950 to Charles H. Copp.

The plant of the Standard Steel Car Co., Butler, Pa., will resume operations in full on April 1.

General Industrial Notes:—

The Fort Wayne Iron & Steel Co., which began operations Dec. 24, is now employing 450 men, running three furnaces with a capacity of 140 tons daily. The fourth furnace will soon be ready and will give the plant a capacity of 200 tons.

The Gustafson Mfg. Co., Chattanooga, Tenn., has just installed a complete line of patternmaking machinery especially constructed for getting out patterns for self-oiling car-wheels.

C. G. Folson, proprietor of heavy sheet iron works, South Bend, Ind., has recently added additional machinery to his plant and is enjoying a prosperous business. He has a varied line of manufactures, one of the principal products being rural mail boxes, of which he has sold over a million.

The Cedar Point Foundry, of Port Henry, N. Y., whose foundry was recently destroyed by fire, has taken over the Hartwell Foundry & Machine Shop, of Plattsburgh, N. Y., and will move its business there. The machine shop at Port Henry was not damaged and for the present will be operated in connection with the recently acquired plant.

The B. S. Constant Machine & Foundry Co., of Bloomington, Ill., has been formed by the consolidation of the B. C. Constant Co. and the Allen & Harwood Iron & Brass Foundry Co., both of Bloomington.

The firm of Gage & Rowe, proprietor of the Buford Foundry & Machine Works, Buford, Ga., has been dissolved. The business will be conducted by D. H. Gage.

Bids opened a few days ago by the ordnance department, U. S. Army, for furnishing from 400 to 500 cast iron 800-pound 12-inch mortar shells were as follows: The Tredegar

Co., Richmond, Va., each, $22.50; Richmond Iron Works, Richmond, Va., $27.98; Bethlehem Steel Co., South Bethelem, Pa., $30.00; U. S. Rapid Fire Gun & Power Co., Derby, Conn., $44.50; A. Garrison Foundry Co., Pittsburg, Pa., $48.45; Mansfield Engineering Co., Mansfield, Ohio, $48.90; Providence Engineering Works, Providence, R. I., $49.00. The contract has been awarded to the Tredegar Co.

Following the recent consolidation of the Bess Machine Co., manufacturer of laundry machinery and supplies, and the Betz Sheet Metal Factory, both of Hamilton, O., the consolidated company, the Betz Mfg. Co., moved into new quarters at the corner of Seventh street and P., C. C. & St. L. R. R., opposite Pennsylvania R. R. passenger depot. As the new quarters are quite spacious, the company will not build an addition for the present. It is well equipped to manufacture laundry machinery and supplies and to conduct a sheet metal factory. It will make and sell everything required to modernly equip a laundry, operated either by steam or by hand. It manufactures sheet metal specialties exclusively, such as safe deposit boxes, tin and steel boxes for all purposes, plain and decorated tea and spice boxes and cans, sheet metal automobile supplies, gasoline and water tanks for manufacturers of gasoline engines, etc., etc.

The Springfield Furnace Co., incorporated March 3, has bought the business and outfit of the Springfield Furnace Co. (not incorporated). The company's stockholders are principally of Cincinnati, but the business will be carried on in Springfield, O. The company is moving into another building which it has leased for a year. It will put in a small additional equipment in the form of machines suited to handling heavier metal. The business will be conducted on a moderate and conservative basis for the present year, as the capitalization of the company is small and it does not propose to put any water in the stock. If the result of the year's business is as good as it may reasonably expect, judging from the business that has been done heretofore by the old concern, it is probable that next spring the capital will be increased and that the company will erect its own building. For the present year it will get its castings made at job foundries. The company will manufacture coal furnaces, special gas furnaces, gas stoves and gas burners.

The Quincy Foundry & Novelty Co., Quincy, Ill., recently increased its capital from $20,000 to $40,000, which was necessary because of the increase in its business. The company is enlarging its foundry to the extent of a few additional floors, and has increased its warehouse capacity at least one-third.

The National Brass & Iron Works, Reading, Pa., whose plant was recently visited by fire, will soon re-equip their buildings. The company will arrange for their special equipment direct with manufacturers.

B. Tanner, of Sturgis, Mich., will establish a plant at Milton, Ind., for the manufacture of steel chairs and steel buggy bodies.

The Racine Steel & Iron Mfg. Co., Racine, Wis., has changed its name to the American Skein & Foundry Co.

The Salem, O., plant of the American Steel & Wire Co. has recently added to its equipment considerable machinery shipped from the New Castle mills which have been closed.

The contract for the structural work on the train shed of the new passenger depot at Atlanta, Ga., has been awarded to the American Bridge Co., the contract price being about $80,000. The structural steel work is to be completed within six months after the signing of the contract. The entire cost of the train shed will be more than $400,000.

The plant of the Knoxville Wheel & Foundry Co., Knoxville, Tenn., recently destroyed, will not be rebuilt immediately. It is expected that the matter will be considered at a meeting of stockholders, the date of which has not been set.

The site on Artizan street, New Haven, Conn., occupied for a number of years by E. Stannard & Son, iron founders and patternmakers, has been sold to the Consolidated railroad. Negotiations are now being conducted for the sale of the Stannard business.

The Crane Co., of Chicago, manufacturer of steam pipes, fittings and engineers' supplies, will establish a branch at Spokane, Wash, for the sale of its products.

N. P. Anderson has become sole proprietor of the plant and business of the Edgerton Foundry, Edgerton, Minn., his former partner, Carl Collins, having sold out his interest to Mr. Anderson.

The Graham Iron Co.'s furnace at Graham, Va., will be blown out as soon as the ore on hand and in transit is used. The reason for the shutdown is the decrease in the price of iron.

The property of the Boston Steel & Iron Co., Boston, has been sold to the Daniel Russell Boiler Works. The property includes a machine shop, boiler house and several other buildings.

A gang of workmen from the steel plant of the Colorado Fuel & Iron Co. has gone from Pueblo, Colo., to Laramie, Wy., to dismantle the steel plant in that city which was purchased some time ago by the Colorado Fuel & Iron Co. and closed. The plant will be moved to Pueblo.

The August Schwab Iron Works, Two Rivers, Wis., which succeeded the Two Rivers Iron Works, have again changed hands. Frank Becker, formerly of Two Rivers, now of Milwaukee, has bought the equipment and secured a lease of the plant and will soon take charge.

Citizens of Alexandria, Ind., are endeavoring to obtain subscriptions to the amount of $10,000 to purchase capital stock of the National Range Works, of Freeport, O. It is expected that if this purchase of stock is made the company will move its plant to Alexandria.

Lincoln & Benzinger is the name of a new firm at Aurora, Ill., which will carry on the manufacture of metal novelties. New and special machinery is being constructed for the firm by the Bliss Co., of Brooklyn, N. Y. The firm will start business with a force of 40 employes.

The Indiana Bridge Works, which have been shut down for a number of weeks, have resumed operations. A large number of orders are on hand.

The Shawmut Railroad Co.'s foundry at Angelica, N. Y., which has been closed down for some time, is again in operation in connection with the machine shops at Angelica.

On March 11 the Ball Engine Co., of Erie, Pa., made a shipment, composed of four cars, carrying a large 20 x 38 x 30 horizontal cross compound side crank engine, of the Corliss type, direct connected to 400-k. w. alterantor; alternator and wheels placed between the frames. This shipment went to the National Tube Co., of Pittsburg.

The United States Cast Iron Pipe & Foundry Co. has been awarded the contract for supplying 800 tons of water pipe, specials and loam castings for the Cincinnati Water Works at $31,000.

The Gas Appliance Mfg. Co., Grand Rapids, Mich., recently incorporated, is the successor of the Grand Rapids Gas Regulator Co., and has leased a building in which it will carry on its business.

The Blonder Bros. Mfg. Co., Chicago, recently incorporated with a capital of $24,000, succeeds the firm of Blonder Bros., manufacturers of brass and iron bedsteads. Associated with Joseph and Adolph Blonder, who formerly conducted the business, is their younger brother, Edward Blonder, who has been employed by them a number of years.

The Prince Foundry Co., Muskegon Heights, Mich., has been sold to the E. H. Stafford Co., Ionia, Mich., and will be moved to the latter city. Chas. Prince, who was proprietor of the company bearing his name, will be superintendent of the foundry at Ionia.

The directors of the Penn Shovel Co., Warren, O., have elected the following officers: President, Andrew Walton, vice president, G. L. Fordyce; secretary, Washington Hyde; treasurer, J. W. Morris. Machinery from the plant at Corry, Pa., is rapidly arriving.

The Canada Corundum Co., Ltd., of Toronto, Can., announces that its new mill at Craig mine was completed on Feb. 15, with a capacity of 5,000 to 8,000 tons a year of finished product.

The Chattanooga Furnace Co., Chattanooga, Tenn., has been reorganized. President J. R. Rice has retired and is succeeded by B. F. Miller, of St. Louis, who will be president and general manager of the concern. The capital of the company has been increased to $100,000.

THE MODERN BLAST FURNACE IN ENGLAND.

In the London *Engineering Review* A. Humboldt Sexton presents the following article on the changes in recent years and in earlier periods, in the construction and operation of blast furnaces in Great Britain:

The blast furnace consists essentially of a vertical chamber, which is kept filled with the mixture of iron ore, flux, and fuel, and into the bottom of which enough air is forced to maintain the combustion, and keep up the necessary temperature. As the air comes in contact with the fuel combustion takes place, the coke burns away, the iron and slag melts, and fresh solid material comes down to take its place. Thus a hot zone, or zone of combustion, is produced where the final reactions take place, and the charge is melted. This zone of combustion, however, never occupies a very large space in the furnace, and from it the hot gases—the carbonmonoxide produced by the combustion and the nitrogen from the air—rise at a high temperature, heating in their ascent the charge above, and escaping somewhat cooled at the top of the furnace. In a low furnace the gases escape at a high temperature, and thus cause considerable loss of heat; but as the furnace is made taller, the temperature of the escaping gases falls till it reaches a minimum. One of the most marked differences between the old and modern furnaces is the increased height of the latter, and this increased height has been found to be attended with great saving in fuel. There is another reason why increased height is attended with economy. This is, that the oxide of iron should be reduced by carbonmonoxide near the top of the furnace; any oxide escaping reduction being reduced at the expense of the carbon lower down. With high furnaces the charge is much more likely to remain long enough in contact with carbonmonoxide at a moderate temperature to ensure complete, or nearly complete, reduction than with shorter furnaces. The limit of height will thus obviously be that at which the gases are fully cooled and the oxide is reduced by the carbonmonoxide in the upper zone of the furnace. Increased height, of course, entails increased cost of building, and a point is reached when any saving that may be obtained is counterbalanced by the increased cost of erection. The increase in height has gone on from year to year till it has increased from about 40 feet up to 80 feet or 90 feet, which seems to be about the maximum advantageous height for furnaces working on coke under ordinary conditions.

There is another condition which limits the height of furnaces, and in some districts prevents the use of large furnaces—that is, the resistance of the materials of which the charge is composed to crushing. It is absolutely essential for good working that the charge should remain "open," so as to give free passage for the ascending gases, and this is impossible if the charge crushes to powder under the weight of the superincumbent mass of material, for in that case the draught will be impeded, and the furnace will work badly. It is obvious, therefore, that where any portion of the charge crushes easily only small furnaces can be used. This is the case with charcoal furnaces, which rarely exceed 40 feet in height; and in Scotland, where raw coal is used, which gives an easily crushable coke, about 60 feet is the limit of height for good work.

Other dimensions of the furnaces have increased in a similar manner, and for similar reasons. The furnaces are now built much larger in diameter, the increased diameter having to a large extent the same effect as increased height in ensuring reduction by carbonmonoxide and cooling the gases by reducing the rate at which the gases pass upwards. There are other dimensions which are fixed by quite different conditions. The diameter at the throat is fixed by the nature of the charging arrangement and its capacity to distribute the charge evenly over the top. The diameter of the hearth is limited by the power of the blast to penetrate into the charge, for there must be no part beyond the reach of the blast. With the moderate blast pressures generally used in this country (5 lb. to 7 lb.) the maximum diameter of hearth is 8 feet or 9 feet, whilst with the much higher pressures now coming into use (7 lb. to 11 lb.) a hearth 11 feet or 12 feet in diameter can be used.

The height of the furnace, its maximum diameter, and the diameter of the hearth being fixed, the contour may still vary very considerably, according to the height at which the bosh—or point of maximum diameter—is placed. This is usually so fixed that the angle of the bosh—that is, the angle of a line drawn from the widest diameter to the top of the hearth will be inclined at about 75 degrees to the horizontal, this angle varying in modern furnaces only within narrow limits. The tendency is also to give the interior of the furnace a flowing contour by rounding off all sharp angles.

Externally the furnace has been changed even more than internally. The older furnaces were solid masses of masonry, the idea apparently being to keep in as much heat as possible. Modern furnaces are, on the other hand, iron shells lined with a layer of brickwork 5 feet or 6 feet thick, this being sometimes so far reduced that the charging platform and appliances must be carried on a separate framework. The older iron-cased furnaces had a double lining, an outer one of ordinary brick and an inner one of fire-brick, the two being separated by a thin layer of ashes. This is now frequently abandoned, one lining of fire-brick only being used. All modern furnaces completely cased with iron. The superstructure is carried on a series of iron columns, so as to allow free access to all parts of the furnace, and the tendency of late has been to greatly increase the height of these columns, so as to allow freer access of air to the bosh, and thus to facilitate cooling; and in the latest furnaces, which are driven hard, the bosh is further cooled by bronze or iron cooling blocks, through which a current of water can be made to circulate, being built into the masonry, or by a stream of water being made to circulate round it so as to keep it cool.

The introduction of the hot blast by Neilson in 1828 worked a revolution in iron smelting, and at once—even when the blast was only moderately heated—led to an enormous increase in the output of iron and a decrease in the consumption of fuel, as will be seen from the following figures of the results obtained at the Clyde Ironworks, where the invention was first put into practice:

	Weekly Make per Furnace.		Coal per Ton of Iron.		
	Tons.	Cwts.	Tons.	Cwts.	Qrs.
1829. Jan. to Aug.: Coke and cold air,	36	18	8	1	1
1830. Jan. to Aug.: Coke and hot air, 300 deg. Fahr.	54	1	5	3	1
1833. Jan. to Aug.: Coke and hot air, 600 deg. Fahr.	61	1	2	5	1

With the old pipe stoves only a moderate temperature (about 600 degrees Fahr.) could be obtained, but in 1860 Mr. Cowper invented the fire-brick regenerative stove, and higher temperatures became easily obtainable. Now, with such stoves, the blast is heated to about 1400 degrees Fahr.

The introduction of the hot blast has modified the conditions of working in many ways. The fuel consumption is much reduced, part of the necessary heat being supplied by the hot blast; and as the air is hot there is less expansion, and the absorption of heat by expansion being less the temperature of the zone of fusion is much higher. It might at first sight seem that a taller furnace would be needed to cool the hotter gases, but this is not so, as the quantity of air used is much less.

The rate at which a furnace is driven—that is, the amount of coke burnt and ore reduced in a given time—depends on the amount of air sent in. The conditions are so favorable to combustion that any amount of oxygen that can be given will be converted into carbonmonoxide, and a larger supply of air means an increased action and a more rapid descent of the charge.

For rapid driving a large supply of air is necessary, and the furnaces are therefore fitted with eight or ten tuyères, and these may be up to 6 or 7 inches in diameter. With very rapid working the bosh must be sufficiently cooled, and the tuyères themselves must be provided with at least double water coolers.

Modern Developments.

The most important developments of the modern iron industry are in the direction of hard driving, and therefore large outputs. In the older furnaces, and still in Scotland, Staffordshire, and some other localities, the driving is slow, and an output of 300 tons to 400 tons of iron is obtained per week per furnace. In Middlesborough and in North Lancashire, where American methods are coming into use, an output of 1,200 tons to 2,000 tons of iron per week is obtained, the con-

sumption of fuel per ton of iron being about the same in each case.

There is no doubt that the system of hard driving will become general, but ironmasters are by no means unanimous as to its advantages. On the old system a blast furnace would last without relining about 20 years, and there are many running that have been in blast even longer, whilst with the new system the furnace will not stand more than five or six years. The construction of a furnace for rapid driving is much more costly than one for slow driving.

The introduction of rapid driving necessitates a complete change in many of the accessories of the furnace. The amount of air supplied must be very much larger, and more powerful engines must therefore be provided. In all new works the American system of giving each furnace its own engines is being adopted in place of the old system of blowing all the furnaces from one set of engines on the same main. This is undoubtedly an improvement, as it makes the furnaces independent. The engines are built so as to be capable of giving a pressure of 20 lb. if required.

Great improvements have been made in blowing engines, most of those now used being of the direct acting, or of the more recent quarter-crank, type. Internal combustion engines, in which the waste gas from the blast furnaces is used, are already at work, with great success, in a few works, and are being put down at several others. In one new works three such engines will be supplied to each blast furnace. Parsons' turbine is also being applied to supplying air for the blast furnace, and is in use at one works.

Much more efficient heating stoves are required. In the older works, two stoves, or even less, are used for each furnace, but in works for rapid driving at least four stoves per furnace are required and sometimes an additional pair to act as regulators.

As the output of the furnaces is increased the amount of material to be charged increases also. In round numbers, for 1,000 tons of iron obtained, about 3,500 tons of material must be raised to the top of the furnace. It becomes extremely difficult to supply this quantity of material by the ordinary method of handbarrows, and automatic charging has therefore been introduced. The bucket system of the Brown Hoisting Machinery is largely in use in America, and has been fitted to several furnaces in this country, and is being fitted to many others—indeed, to nearly all the new furnaces.

In this system the ore and fuel are charged into buckets, which are run up an inclined plane, and automatically emptied into a revolving distributor, whence they fall on to the bell, and are then charged to the furnace, as usual. With this apparatus, not only is the charging rapid and uniform, but the saving of labor is very considerable.

It also becomes much more difficult to remove its products with sufficient rapidity. In dealing with the slag, Howden's slag conveyor is largely used. This consists of a series of iron molds carried on an endless chain, and slowly moved past the slag notch, so that each mold is filled in passing, and on its passage the slag solidifies, so that it is turned out of the mold solid into a truck put to receive it.

Similar machines have been suggested for dealing with the metal, but have not come into extensive use in this country. Founders select their pig by the appearance of the fracture, and this is very different when the iron is cast in the metal molds of a pig machine to what it is when cast in sand. When the iron is to be used for steel making it is frequently not cast into pigs at all, but is run by means of a ladle into a metal mixer, from which it can be distributed to the steel furnaces as required.

Another direction in which advances have been made is in the recovery of by-products. Various attempts have been made to utilize slag, with more or less success, for the manufacture of paving blocks, Portland cement, and other purposes; but these have, as yet, been used only on a very small scale. Indeed, when one considers the enormous amount of slag in existence, and being produced each year, it is obvious that its general utilization, unless for the manufacture of something for which there is an enormous demand, would lead to production far in excess of that which could be utilized.

In Scotland and some other districts where raw coal is used for fuel, tar and ammonia are recovered; and in other districts these may be recovered from the ovens in which the coal is coked.

The gas is the most important by-product, and this is now always utilized to some extent. It is invariably used for heating the blast, hot blast stoves with separate fires being extinct; this, however, requires only a small portion of the gas, and the remainder is used for steam raising. For this purpose, however, the gas is unsuited, as it burns with a non-luminous glare, and the use of the gas in this way is very wasteful. As, however, there is more gas than is needed, this has not been a matter of much moment. The use of the gas in internal combustion engines is very much more economical; but for this purpose the gas must be previously washed, to remove dust, etc. By so using it, however, a large amount of power will be obtainable over and above that needed for supplying air to the furnaces, and which therefore may be used for other purposes. It must be remembered that only about one-half the energy of the fuel is utilized in the blast furnace, and the other half can be obtained by combustion of the gas.

It will be seen that the recent developments in blast furnace practice have been mainly in the direction of securing increased output, and at the same time of economizing labor, the latter being to a large extent subsidiary here, though of much more importance in the United States, where wages are much higher. There is room in many cases for a large saving of labor, and when one sees the wasteful methods used in many of our works one is apt to wonder whether cheap labor is after all a good thing.

There is no doubt that our pig iron industry is undergoing a revolution, that in the near future the average output per furnace will be largely increased, and that the cost of production will probably be reduced. At the same time there seems to be a steady improvement in the uniformity of the material made, and this has been largely brought about by buyers specifying the composition of the iron they need. This uniformity is less marked in pig iron for foundry purposes, where specifications of composition are less generally used.

Lackawanna Steel Co.

The annual meeting of the Lackawanna Steel Co. was held in Buffalo last week. The following were elected directors to serve for three years: H. A. C. Taylor, H. McK. Twombly, Cornelius Vanderbilt, Adrian Iselin Jr., B. S. Guinness, Marc T. Cox and William E. Reis. All these directors are from New York City. Messrs. Cox and Reis are new directors. The others were re-elected. Mr. Reis is a brother of Vice-President George L. Reis of the Lackawanna Steel Co. The 14 old directors who held over are D. O. Mills, of New York; Samuel Mather, of Cleveland; Moses Taylor, of New York; Walter Scranton, of East Orange, N. J.; Henry Walters, of Baltimore; Moses Taylor Pyne, of New York; James Speyer, of New York; R. B. VanCortlandt, of New York; George R. Fearing Jr., of Boston; J. J. Albright and Edmund Hayes, of Buffalo; C. Ledyard Blair, of New York; Gov. J. G. McCullough, of Vermont; and Warner Delano Jr., of New York. An officer of the company stated that about April 1 another blast furnace will be started and that the output of steel rails will be increased. The company's daily output of steel rails is now from 1,200 to 1,300 tons. It is expected that during the early summer the company will begin the manufacture of structural steel, steel plates, bars, etc. At present the company has 4,000 employes on its pay roll.

As a result of the action of the Mexican Government in placing a duty on steel rails and other steel products it is reported that the Hercules iron mines, situated in the State of Chihuahua, are to be developed. It is stated that a Dutch syndicate has acquired the property and will establish an iron and steel plant to rival in size the plant which is now in operation at Monterey.

The Toronto & Niagara Power Co. has decided to use steel towers on its transmission line from Niagara Falls, Ont., to Toronto, instead of wooden poles. The towers will be eight or ten feet square at the base and about 50 feet high at the cross arms and will be erected at intervals of 400 feet.

Cochrane Separators

Cochrane Steam Separators give protection to engines by taking out water coming with the steam entering them. They also give most satisfactory results on compressed air lines.

Cochrane Oil Separators are noted for their success in taking cylinder oil or grease out of exhaust steam. More than 4,000,000 H. P. of boilers are now being protected from cylinder oil by **Cochrane Separators.**

The highest attainable efficiency is given with the minimum reduction in pressure. The **Oil Separators** are positively self-cleaning.

The flanges, gaskets, bolts, water gauge fittings, valves, etc , furnished are all of the first grade. Workmanship, materials, capacity and efficiency guaranteed. Sold subject to return at our expense if not thoroughly satisfactory to the user. **Send for Catalogue 11-S.**

HARRISON SAFETY BOILER WORKS, Clearfield & 17th Sts., Philadelphia, Pa.

Manufacturers of Cochrane Feed Water Heaters and the Sorge-Cochrane Systems.

MANUFACTURING PLANT FOR SALE

AT PITTSBURG, PA.

FOR LESS THAN GROUND IS WORTH

Thirteen lots 25 x 100. Buildings with 14,000 ft. floor space and stable. 125 H. P. engine and boiler. Income from two lots leased $420 per year. Railroad siding into the property connected to P. & L. E. and Penna. Company. This property is situated at McKees Rocks and was appraised at $26,000. Will sell for 40 per cent less on easy terms if taken quick. C. R. ANDERSON, South Ave., Allegheny, Pa.

Sloss-Sheffield Steel and Iron Company

BIRMINGHAM, ALABAMA

Manufacturing following well known brands of Foundry Iron:

J. W. McQueen, General Sales Agent	Birmingham, Ala.
A. S. Leath, Southern Sales Agent	Birmingham, Ala.
Hugh W. Adams, 15 Beekman Street	New York City
Hugh W. Adams, 85 Water Street	Boston, Mass.
J. K. Dimmick & Co., Drexel Building	Philadelphia, Pa.
J. K. Dimmick & Co., Murtland Building	Pittsburg, Pa.
J. K. Dimmick & Co., Ellicott Square	Buffalo, N. Y.
Robert Field, 1105 Traction Building	Cincinnati, O.
William Wieman, 605 Citizens Bank Building	Cleveland, O.
E. C. Smith, 506 Commonwealth Trust Building	St. Louis, Mo.
David Evans, 1030 Monadnock Block	Chicago, Ill.
W. H. Palmer, Pioneer Press Building	St. Paul, Minn.
Zimmerman-Wells-Brown Co., 2d and Ash Streets	Portland, Ore.
Hardy Greenwood, P. O. Box 751	San Antonio, Tex.
T. R. Hassam, 1 Calle de las Damas 5	Mexico City
F. S. Walshe, 325 Ca ondelet Street	New Orleans, La.
Edwin R. Haas, 37 Prior Street	Atlanta, Ga.
William Jacks & Co., 41 St. Vincent Place	Glasgow, Scotland

"Sloss," "Florence," "Sheffield," "Lady Ensley,"

SHIPPERS OF

FOUNDRY COKE FROM WASHED COAL

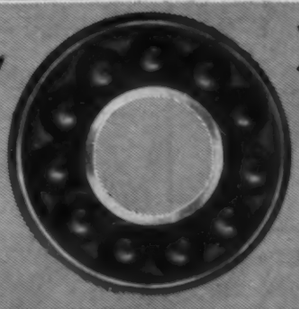
CELEBRATED

SLOSS PRATT STEAM and

BLOCK DOMESTIC COAL

Cable address, SLOSS, BIRMINGHAM, using Lieber's A-1, Watkins, Western Union Telegraphic and the Atlantic Cable Directory Codes.

STEEL BALLS



The test of quality lies in service. The best balls are known as "High Duty." We make them.

Something more than a micrometer is needed to distinguish good balls from bad ones.

FEDERAL MANUFACTURING COMPANY

CLEVELAND BALL FACTORY — Cleveland

American Sheet & Tin Plate Company

Frick Building PITTSBURGH, PA.

Manufacturers of all varieties of

Iron and Steel Sheets

and

Tin and Terne Plates

BLACK and GALVANIZED
PLAIN and PAINTED
CORRUGATED and "V" CRIMPED
APOLLO BEST BLOOM GALVANIZED
WOOD'S PATENT PLANISHED IRON
WOOD'S CLEANED REFINED SHEETS
WELLSVILLE POLISHED STEEL SHEETS
COLD ROLLED SHEETS
PICKLED and COLD ROLLED SHEETS
STAMPING IRON and STEEL

CHARCOAL BRIGHT TIN PLATES
COKE BRIGHT TIN PLATES
TAGGERS TIN
TINNED DAIRY SHEETS
AMERICAN TERNE PLATES
M. F. ROOFING TIN
U. S. EAGLE ROOFING TIN
NUMETHOD ROOFING TIN
LONG TERNE SHEETS
CONTINUOUS ROOFING TIN

DISTRICT SALES AGENTS

W. J. Wetstein, Security Bldg., St. Louis, Mo.
W. T. Shannon, Union Trust Bldg., Cincinnati, O.
Richard R. Hoge, Ainsworth Block, Portland, Oregon.
John R. Scott, Hennen Bldg., New Orleans, La.
W. H. Eaton, Marquette Bldg., Chicago.
Frank Dickerson, Battery Park Bldg., New York.
Edw. M. Sparhawk, 101 Boston Bldg., Denver, Colo.
I. B. Williams, San Francisco, Cal.

AMERICAN STEEL HOOP COMPANY

GENERAL SALES OFFICES:
CARNEGIE BUILDING, PITTSBURGH, PA.

DISTRICT SALES OFFICES:

ATLANTA: - - - - Equitable Building
BOSTON: - - - - Telephone Building
BUFFALO: - - - German Insurance Building
CHICAGO: - - - - - The Rookery
CINCINNATI: - - - Union Trust Building
CLEVELAND: - - - Perry-Payne Building
DENVER: - - - 101, 102 Boston Building
DETROIT: - - - - Union Trust Building
NEW YORK: - - - - Empire Building
PHILADELPHIA: - - - Harrison Building
SAN FRANCISCO: - - - 226 Market Street
ST. LOUIS: - - New Bank of Commerce Building
WASHINGTON: - - National Safe Deposit Building
ST. PAUL: - - - - Pioneer Press Building
NEW ORLEANS: - - - Hennen Building

FOREIGN SALES OFFICES:

CITY OF MEXICO: - - - 924 Apartado
MONTREAL, CANADA: - Bell Telephone Building
SIDNEY, N. S. W.: Mutual Life Bldg,, 14 Martin Place

"THE LEADING MARINE PUBLICATION OF THE WORLD"

MARINE REVIEW

Our Fitting-Out Number Issued March 10th has Ninety Illustrations and Should be Generally Read by Every American Citizen.

A FEW OF ITS LEADING FEATURES ARE

"A BRIEF MESSAGE ON THE FUTURE OF AMERICAN SHIPPING," by Hon. George B. Cortelyou, Secretary of the Department of Commerce and Labor.—Illustrated.

"THE AMERICAN MERCHANT MARINE," by Senator William P. Frye, Chairman of the Committee of Commerce of the United States Senate.—Illustrated.

"AMERICAN WATERWAYS," by Hon. T. E. Burton, Chairman of the Committee on Rivers and Harbors of the House of Representatives.—Illustrated.

"AMERICAN SHIPPING," by Mr. A. R. Smith, Superintendent of the Maritime Association of the Port of New York.

"WHY NO PROTECTION FOR THE SHIP?" by Winthrop L. Marvin, author of "The History of the American Merchant Marine."—Illustrated.

"WHY CONGRESS SHOULD AID SHIPPING.—FROM THE WORKINGMAN'S STANDPOINT," by John McNeil, President and Organizer of the Brotherhood of Boilermakers and Iron Ship Builders.

"ERIE CANAL ENLARGEMENT," by Col. Thomas W. Symons, member of the Greene Canal Commission and United States Engineer in charge of Executive Mansion at Washington.—Illustrated.

"FUTURE OF LAKE SHIP BUILDING," by Mr. W. L. Brown, President of the American Ship Building Co.—Illustrated.

"UNIFORMITY OF SAILING REGULATIONS ON THE GREAT LAKES," by Harvey D. Goulder, Counsel for Lake Carriers' Association.—Illustrated.

"ENGINES OF THE NEW BATTLESHIPS IDAHO AND MISSISSIPPI." A complete Description, by W. F. Sicard, Bureau of Steam Engineering, Navy Department. Illustrated with fine engravings made from working drawings.

"DEVELOPMENT OF MOTOR BOATS," by R. C. Monteagle, member Society of Naval Architects and Marine Engineers.—Illustrated with photographs and working drawings of engines.

"SHIP BUILDING IN MAINE." What is being done in wooden tonnage.—Illustrated with photographs.

"MARITIME ACHIEVEMENTS ILLUSTRATED IN SCULPTURE." These are reproductions of wonderful statuary that will be seen at the coming World's Fair at St. Louis.—Illustrated with fine photographs.

"NEW TYPE OF DIPPER DREDGE FOR THE DOMINION GOVERNMENT," by A. W. Robinson, Consulting Engineer for the Department of Public Works of the Dominion Government and Member of the American Society of Civil Engineers.—Illustrated with several engravings of hull and machinery.

"SCREW TOWBOATS ON THE MISSISSIPPI RIVER.—A NEW DESIGN." Illustrated with three engravings of hull and engines.

"STEAMSHIP DAKOTA FOR THE GREAT NORTHERN STEAMSHIP CO." Description and photographs of the largest vessel ever built in the United States.

"SIDE-WHEEL STEAMER, J. T. MORSE." Description of hull and engines with engravings of sheer plan.

"ALEXANDER MACKENZIE." A biographical sketch with portrait of the new Chief of Engineers of the War Department.

"JOHN W. COLLINS." A biographical sketch of the Engineer-in-Chief of the Revenue Cutter Service.

"NEW REVENUE CUTTER No. 14," by Captain John W. Collins, Engineer-in-Chief Revenue Cutter Service.—Illustrated with engravings of hulls and engines.

"PANAMA CANAL,"—Its Present Condition Graphically Described. The new machinery that must be secured to construct it.—Illustrated with photographs.

"THE LIFE SAVING SERVICE—ITS HISTORY AND ITS WORK."—Illustrated with photographs.

"SUSPENDED CAR TRANSFER BRIDGE OVER SHIP CANAL AT DULUTH." This is the only bridge of its kind in the United States and the second in the world, the other being at Rouen, France.—Illustrated with an engraving.

WEEKLY

THE PENTON PUBLISHING COMPANY | Three Dollars A Year | Order from your News Dealer | Single Copy 10 cts. | CLEVELAND CHICAGO DETROIT NEW YORK

NATIONAL TUBE COMPANY,

Manufacturers of

BLACK and GALVANIZED

Wrought Merchant Pipe, all kinds, sizes 1-8-inch to 30-inch, fitted in any manner desired.

BOILER TUBES,

Mild Steel and Charcoal Iron, for Stationary, Locomotive and Marine Work.

CASING, TUBING

and Drive Pipe for Well Purposes.

GAS and OIL LINE PIPE.

CYLINDERS,

Lap-Welded and Seamless, tested from 100 to 3,700 lbs., for Compressed Air, Carbonic Acid Gas, Anhydrous Ammonia, etc., etc., etc.

WATER and GAS MAINS,

Converse and Matheson Lead Joint Pipe, 2-inch to 30-inch.

SEAMLESS

Tubes, Shrapnel, Projectiles and Miscellaneous Forgings.

GENERAL OFFICES:

Frick Building, Pittsburg, Pa.

LOCAL SALES OFFICES:

Havemeyer Building, New York. Empire Building, Pittsburg.

Western Union Building, Chicago.

267 South 4th Street, Philadelphia. 420 California Street, San Francisco, Cal.

FOREIGN OFFICES:

Nos. 71 and 72 King William Street, London, E. C., England.

TELEGRAPHIC ADDRESS—TUBULIFORM, LONDON.

AMERICAN IRON & STEEL MFG. CO.

General Offices at LEBANON, PA., U.S.A.

MANUFACTURERS OF

Merchant Bar Iron and Steel

(ANNUAL CAPACITY ABOUT 150,000 TONS)

ALSO EVERY VARIETY OF

Machine Bolts, Nuts, Washers, Turnbuckles, Lag Screws, Railway and Dock Spikes, Harvey Grip and other Railway Track Bolts. Boiler, Ship and Structural Rivets. Car Forgings and Rods and Irons for Bridges, Buildings, Etc., Etc.

This Company owns and operates the works formerly owned by J. H. STERNBERGH & SON, Reading, Pa. NATIONAL BOLT, NUT AND RIVET WORKS, Reading, Pa. LEBANON IRON CO., Lebanon, Pa. EAST LEBANON IRON CO., Lebanon, Pa. PENNSYLVANIA BOLT AND NUT CO., Lebanon, Pa.

All sizes and kinds SPECIAL WIRE for every purpose

HIGH GRADE

WIRE ROPE

AND

WIRE STRAND

THE NATIONAL WIRE CORPORATION

TRADE MARK

EXTRA DOUBLE GALVANIZED

TELEPHONE

AND

TELEGRAPH WIRE

THE NATIONAL WIRE CORPORATION

NEW HAVEN, CONN.

BOSTON NEW YORK CHICAGO KANSAS CITY DE KALB SAN FRANCISCO

The Upson Nut Co.,

Cleveland, Ohio,

MAKERS OF

CARRIAGE
MACHINE
PLOW
SPRING
ELEVATOR
FANCY
STOVE
TIRE

Bolts

HOT PRESSED
COLD PUNCHED
SEMI-FINISHED
CASE HARDENED

Nuts

ALSO

Coach and Lag Screws, Washers, Boiler and Structural Rivets, all of the highest possible quality and finish.

Catalog and Prices on application.

A SINGLE MACHINE may be all you want just now. Send in your order—it will receive the same prompt attention as a larger one.

WIRE MILLS, CHAIN FACTORIES

A COMPLETE INSTALLATION the whole thing from A to Z may be your need. We will furnish you an equipment unequalled anywhere.

Write for prices stating capacity wanted.

1856 **The TURNER, VAUGHN & TAYLOR CO.** **1903**

Cuyahoga Falls, O., U.S.A.

THE PATTERNMAKER

THE ONLY MAGAZINE OF ITS KIND IN THE WORLD

A new publication in which, month by month, will appear the newest and best ideas in every line of the patternmaking business.

Every up-to-date man in any way interested in the making of patterns will want every issue of this magazine.

THE MEN WHO RUN THE SHOPS will find described therein the latest and best appliances for profitable patternmaking.
It will also tell how to equip and arrange pattern shops to reduce cost and increase production.

Costs but $1.00 a year

(Foreign subscriptions, $2.00.)

Worth many times its cost to every constant reader

A sample copy for the asking

Published by

THE IRON AND STEEL PRESS CO.

CLEVELAND, O.

Publishers of **THE FOUNDRY**
THE PATTERNMAKER
THE IRON TRADE REVIEW